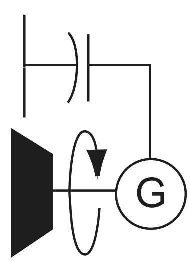
S-PRO 4000

Model: S-PRO 4001

Sub-Harmonic
Monitoring and Protection Relay



User Manual

Version 2.0 Rev 0

Preface

Information in this document is subject to change without notice.

This manual is part of a complete set of product documentation that includes detailed drawings and operation. Users should evaluate the information in the context of the complete set of product documentation and their particular applications. ERLPhase assumes no liability for any incidental, indirect or consequential damages arising from the use of this documentation.

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Using This Guide

This User Manual describes the installation and operation of the S-PRO protection relay. It is intended to support the first time user and clarify the details of the equipment.

The manual uses a number of conventions to denote special information:

Example	**Describes**
Start>Settings>Control Panel	Choose the Control Panel submenu in the Settings submenu on the Start menu.
Right-click	Click the right mouse button.
Recordings	Menu items and tabs are shown in italics.
Service	User input or keystrokes are shown in bold.
Text boxes similar to this one	Relate important notes and information.
..	Indicates more screens.
▶	Indicates further drop-down menu, click to display list.
	Indicates a warning.

Acronyms

ASG - Active Setting Group

CID - file extension (.CID) for Configured IED Description

CS - Control Switch

CT - Current Transformer

DCB - Directional Comparison Blocking

DCE - Data Communication

DIB - Digital Input Board

DIGIO - Digital Input/Output Board

DSP - Digital signal processor

DTE - Data Terminal Equipment

FPCB - Graphics Front Panel Comm Board

FPDB - Graphics Front Panel Display Board

GPS - Global Positioning System

HMI - Human Machine Interface

ICD - file extension (.ICD) for IED Capability Description

IEC - International Electrotechnical Commission

IED - Intelligent Electronic Device

IP - Internet Protocol (IP) address

IRIG-B - Inter-range instrumentation group time codes

LED - Light-emitting Diode

LHS - Left Hand Side

LOP - Loss of Potential

MPB - Main Processor Board

MPC - Micro Processor

RAIB -Relay AC Analog Input Board

RASB -Relay AC Analog Sensor Boards

RHS - Right Hand Side

RPCB - Rear Panel Comm Board

RTOS - Real Time Operating System

RTU - Remote Terminal Unit

SCADA - Supervisory Control And Data Acquisition

SG - Setting Group

TUI - Terminal User Interface

UI - User Interface

VI - Virtual Input

Table of Contents

Version Compatibility

This chart indicates the versions of Offliner Settings, RecordBase View and the User Manual which are compatible with different versions of S-PRO firmware.

RecordBase View and Offliner Settings are backward compatible with all earlier versions of records and setting files. Use RecordBase View to view records produced by any version of S-PRO firmware and Offliner Settings can create and edit older setting file versions.

Minor releases (designated with a letter suffix - e.g. v3.1a) maintain the same compatibility as their base version. For example. S-PRO firmware v3.1c and Offliner Settings v3.1a are compatible.

S-PRO 4001 Firmware/Software Compatibility Guide		
S-PRO Firmware	**Setting Version**	**Compatible** Offliner **Settings**
v2.0	402	v2.1 or greater
v1.0	401	v2.0 or greater

Please contact ERLPhase Customer Service for complete Revision History.

PC System Requirements and Software Installation

Hardware

The minimum hardware requirements are:

- 1 GHz processor
- 2 GB RAM
- 20 GB available hard disk space
- USB port
- Serial communication port

Operating System

The following software must be installed and functional prior to installing the applications:

- Microsoft Windows XP Professional Service Pack 3 or
- Microsoft Windows 7 Professional Service Pack 1 32-bit or 64-bit

Relay Control Panel requires Windows XP SP3 (it will not work on earlier versions of Windows).

Software Installation

The CD-ROM contains software and the User Manual for the S-PRO Protection Relay.

Software is installed directly from the CD-ROM to a Windows PC. Alternatively, create installation diskettes to install software on computers without a CD-ROM drive.

The CD-ROM contains the following:

- S-PRO Offliner Settings: Offliner settings program for the relay
- S-PRO Firmware: Firmware and installation instructions
- S-PRO User Manual: S-PRO manual in PDF format
- S-PRO Function Logic Diagram: diagram in PDF format
- Relay Control Panel: software
- Relay Control Panel User Manual: manual in PDF format
- USB Driver

To Install Software on the Computer

Insert the CD-ROM in the drive. The CD-ROM should open automatically. If the CD-ROM does not open automatically, go to Windows Explorer and find the CD-ROM (usually on D drive). Open the ERLPhase.exe file to launch the CD-ROM.

To install the software on the computer, click the desired item on the screen. The installation program launches automatically. Installation may take a few minutes to start.

To view the S-PRO User Manual the user must have Adobe Acrobat on the computer. If a copy is needed, download a copy at www.adobe.com.

Anti-virus/Anti-spyware Software

If an anti-virus/anti-spyware software on your local system identifies any of the ERLPhase applications as a “potential threat”, it will be necessary to configure your anti-virus/anti-software to classify it as “safe” for its proper operation. Please consult the appropriate anti-virus/anti-spyware software documentation to determine the relevant procedure.

1 Overview

1.1 Introduction

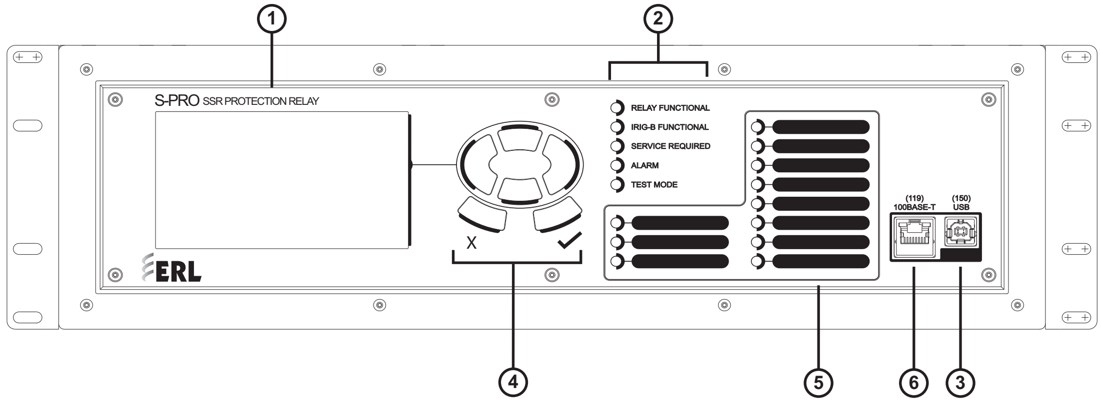
Interaction of series capacitors with the wind system in wind farms can cause undamped sub-harmonic current oscillations. The wind turbine mechanical system (tower to blade) interactions can also generate sub-harmonics. These sub-harmonics can cause serious damage to the wind turbine controllers, induction generators and transformers, and may cause resonance at point of common coupling in the electrical grid. The S-PRO Sub-Harmonic Protection Relay provides monitoring and protection of uncontrolled sub-harmonics ensuring a reliable operation of the power grid.

The S-PRO 4001 relay provides real time processing of voltage and current signals, comprehensive sub-harmonic protection, with sub-harmonic monitoring from 5 Hz to 45/55 Hz. The S-PRO provides 2 sub-harmonic detectors for each 3 phase analog quantities. Each detector is capable of alarming or tripping as configured by the user. An innovative “Operations/Duration” trigger monitors the sub-harmonic level to cope up with the statistical nature of the Wind turbine operations and availability. In addition a total of 4 sets of configurable 3 phase current summation virtual channels are also monitored. These virtual channels allow two sets of 3 phase currents to be added together to form a line current suitable for ring bus configuration. Each of the summated virtual channels also has 2 sub-harmonic detectors associated with them.

Relay Control Panel (RCP) is the Windows graphical user interface software tool provided with all 4000 series and higher (new generation) ERL relays to communicate, retrieve and manage records, event logs, fault logs, manage settings (identification, protection, SCADA etc.,), display real time metering values, view, analyze, and export records in COMTRADE format.

In addition to the protection functions the relay provides fault recording (96 samples/cycle) to facilitate analysis of the power system after a disturbance has taken place. The triggers for fault recording are established by programming the output matrix and allowing any internal relay function or any external input to initiate recording.

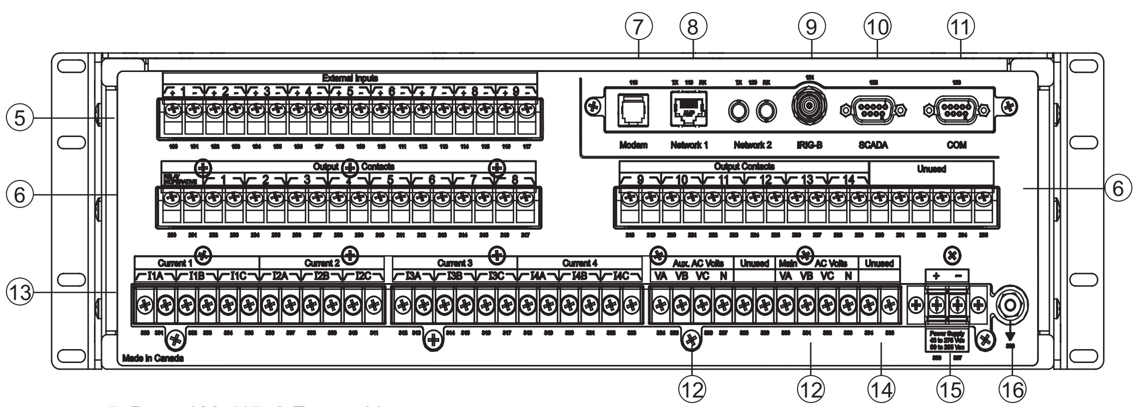
1.2 Front View



1. Front display of time, alarms and relay target
2. LEDs indicating status of relay
3. USB Port 150 for maintenance interface
4. Push buttons to manipulate information on display and to clear targets
5. 11 Target LEDs
6. Ethernet Port 119

Figure 1.1: S-PRO Relay Front View

1.3 Rear View



5. Ports 100-117: 9 External Inputs
6. Ports 200-201: Relay inoperative contact
   Ports 202-229: 14 programmable output contacts
   Ports 230-235: Unused
7. Port 118: Internal modem
8. Port 119-120: 100BASE-T or 100BASE-FX Ethernet Ports
9. Port 121: External clock, IRIG-B modulated or unmodulated
10. Port 122: SCADA
11. Port 123: Direct/Modem RS-232 Port
12. Ports 324-327, 330-333: AC voltage inputs
13. Ports 300-323: AC current inputs
14. Ports 230-235, 328, 329, 334, 335: Unused
15. Ports 336-337: Power supply
16. Port with GND symbol: Chassis Ground

Figure 1.2: S-PRO Relay Rear View

AC Current and Voltage Inputs

The relay is provided with terminal blocks for up to 12 ac currents and 6 phase-to-neutral voltages.

Each of the current input circuits has polarity (•) marks.

A complete schematic of current and voltage circuits is shown, for details see "AC Schematic Drawings" in Appendix I and "DC Schematic Drawings" in Appendix J.

External Inputs

The relay contains 9 programmable external inputs.

Output Relay Contacts

The relay has 14 programmable relay contacts.

Relay Inoperative Alarm Output

If the relay becomes inoperative, then the Relay Inoperative Alarm output contact closes and all tripping functions are blocked.

1.4 Model Options/Ordering

The relay is available as a horizontal mount, for details see "Mechanical Drawings" in Appendix G..

The relay is available with an optional internal modem card. The two rear Ethernet ports can be ordered as one copper-one optical port or both optical ports. Port 119 on the rear panel is available as either 100BASE-T (RJ-45) or 100BASE-FX (optical SI).

The Current Transformer (CT) inputs are 1 A nominal or 5 A nominal. The external inputs are 48/125/250 Vdc. The system base frequency is either 50 Hz or 60 Hz.

The S-PRO 4001 is available in a standard 3U rack model.

All of the above options must be specified at the time of ordering.

2 Setup and Communications

2.1 Introduction

This chapter discusses setting up and communicating with the relay including the following:

- Inter-Range Instrumentation Group time codes (IRIG-B) time input
- Communicating with the relay using a network link, a direct serial link and a modem link (internal, external)
- Using Relay Control Panel to access the relay's user interface
- Using HyperTerminal to access the relay's maintenance menu
- Setting the Baud rate
- Accessing the relay's Supervisory Control And Data Acquisition (SCADA) services

2.2 IRIG-B Time Input

The relay is equipped to handle modulated or unmodulated GPS satellite time IRIG-B signals. The IRIG-B time signal is connected to the BNC connection on the back of the relay. When the IRIG-B signal is provided to the relay the IRIG-B functional Light-Emitting Diode (LED) comes on and the relay clock is referenced to this signal. No settings are required to differentiate between modulated or unmodulated signals; this is automatically detected by the relay.

Enable or disable the IEEE 1344 extension using Relay Control Panel in the *Utilities>Time tab*. The enabled mode allows the year to be received from the IRIG-B signal. If the available IRIG-B signal has no year extension, this setting should be disabled.

2.3 Communicating with the Relay

Connect to the relay to access its user interface and supervisory control and data acquisition (SCADA) services by:

- Front USB 2.0 interface (maintenance)
- 1 front and 2 rear Ethernet network links (user interface and SCADA)
- Direct serial link (user interface and SCADA)
- External or internal modem link (user interface only)

The relay has a front panel USB port (Port 150), a rear panel Ethernet port (Port 120), shared front/rear Ethernet ports (Port 119) and 2 rear serial ports (Port 122 and Port 123) to provide direct access to its user interface and SCADA services

The relay's user interface is accessed through the Relay Control Panel, for details see “Relay Control Panel” on page 3-7.

2.4 USB Link

The PC must be appropriately configured for USB communication.

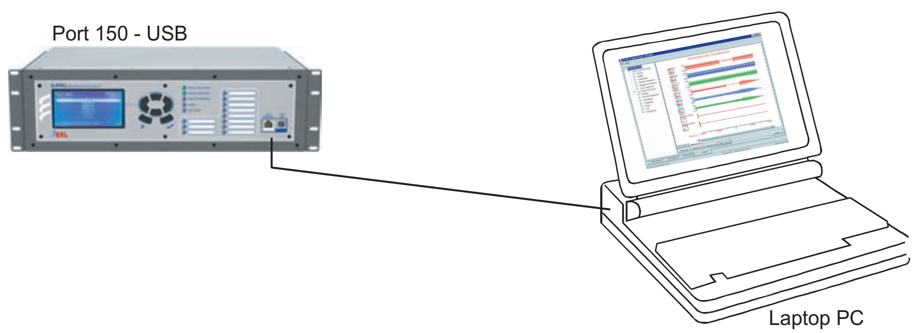


Figure 2.1: USB Link

USB Driver Installation

To create an USB link between the relay and the computer, first the USB driver for the ERLPhase 4000 series device needs to be installed, as follows:

Unzip the file (can be obtained from ERL website):

ERLPhase_USB_driver.zip

In this case we assume you unzipped to the desktop.

In Windows XP or Windows 7

Connect a USB port of the PC to Port 150 (USB front) of the S-PRO-4001. The SPRO-4001 was already powered on.

In the window

“Welcome to the Found New Hardware Wizard”
“Can Windows connect to Windows Update to search for software?”

Check the option “No, not this time”.

In the window

“This wizard helps you install software for:”
“ERLPhase 4000 Series Device”
“What do you want the wizard to do?”

Check the option “Install from a list or specific location (Advanced)”.

In the window

“Please choose your search and installation options”
“Search for the best driver in these locations”

Uncheck the option “Search removable media (floppy, CD-ROM.)”.

Check the option “Include this location in the search”.

Browse for the following folder:

C:\WINDOWS\tiinst\TUSB3410

In the window

“Hardware Installation”
“The software you are installing for this hardware”

“ERLPhase 4000 Series Device”

“has not passed Windows Logo testing to verify its compatibility with Windows XP” or “Windows can’t verify the publisher”

Hit *Continue Anyway*.

In the window

“Completing the Found New Hardware Wizard”
“The wizard has finished installing the software for”

“ERLPhase 4000 Series Device”

Hit *Finish*.

To verify the installation was successful, and to which comm port is the ERLPhase 4000 Series Device configured, do the following:

In Windows XP

Start > Control Panel->Performance and Maintenance->System >Hardware > Device Manager > Ports

or (if using Control Panel's Classic View)

Start > Control Panel > System > Hardware >Device Manager >Ports

In Windows 7 ‘small icons’ view, go to

Start>Control Panel>Device Manager>Ports

Look for the port number associated to this device

“ERLPhase 4000 Series Device”
Look for a COM#, where “#” can be 1, 2, 3, etc. Leave the default settings for this port.

It is recommended to restart the PC after the USB driver installation.

The default baud rate for the relay USB Port 150 is 115200, however to double check it login to the relay display and go to:

Main Menu > System > Relay Comm Setup

2.5 Network Link

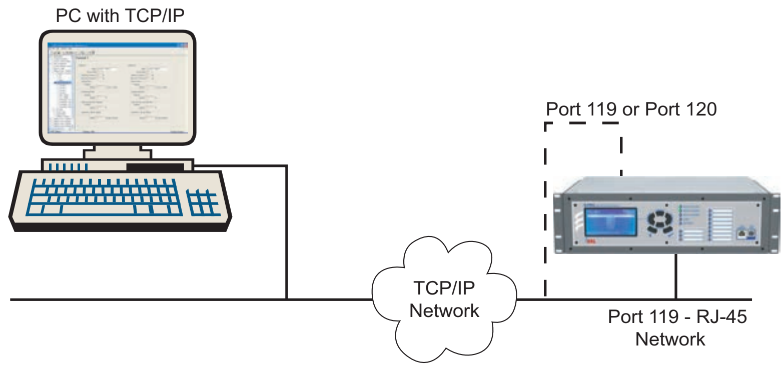


Figure 2.2: Network Link

Access both the relay's user interface and DNP3 SCADA services simultaneously with the Ethernet TCP/IP LAN link through the network ports Port 119 and Port 120. The rear Port 119 and 120 are either 100BASE-T copper interface with an RJ-45 connector or 100BASE-FX optical interface with an ST style connector. Each port is factory configurable as a copper or optical interface. The front Port 119 is 100BASE-T copper interface with an RJ-45 connector.

DNP3 SCADA services can also be accessed over the LAN, for details see "Communication Port Details" on page 2-15.

Connect to the Ethernet LAN using a Cat 5 cable with an RJ-45 connector or 100BASE-FX 1300 nm, multimode optical fiber with an ST style connector.

By default, the Port 119 is assigned with an IP address of 192.168.100.80 Port 120 is assigned with an IP address of 192.168.101.80. If this address is not suitable, it may be modified using the relay's Maintenance Menu. For details see "Using HyperTerminal to Access the Relay's Maintenance Menu" on page 2-9.

2.6 Direct Serial Link

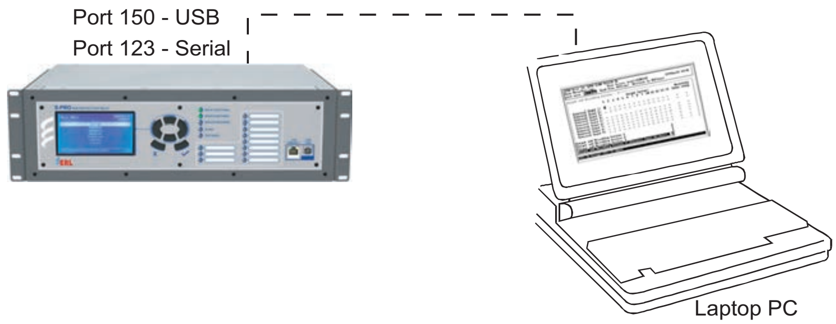


Figure 2.3: Direct Serial Link

To create a serial link between the relay and the computer, connect the computer's serial port and Port 123 on the relay's rear panel provided the port is not configured for modem use.

The serial ports are configured as EIR RS-232 Data Communications Equipment (DCE) devices with female DB9 connectors. This allows them to be connected directly to a PC serial port with standard straight-through male-to female serial cable, for pin-out details see "Communication Port Details" on page 2-15. Rear Port 122 is for SCADA and Port 123 can be used for direct serial access and external modem.

Ensure the relay port and the PC's port have the same baud rate and communications parameter, see "Maintenance Menu Commands" on page 2-11.

2.7 Modem Link

External

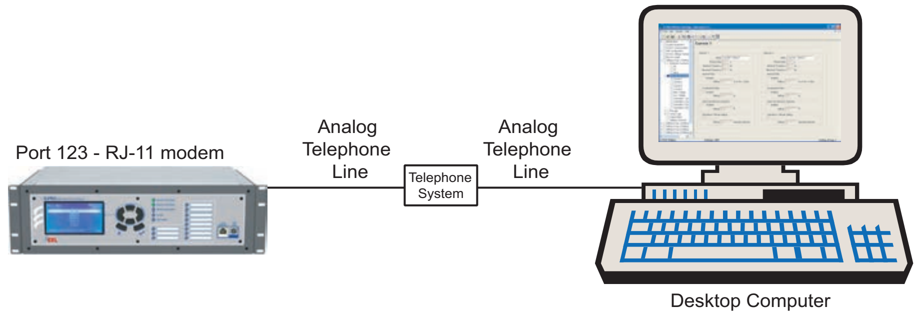


Figure 2.4: External Modem Link

Using an external modem, access the relay's user interface through a telephone link between the relay and the computer.

Connect the serial port on the external modem to the Port 123 on the relay's rear panel. Both devices are configured as RS-232 DCE devices with female connectors, so the cable between the relay and the modem requires a crossover and a gender change. Alternatively, use the ERLPhase modem port adapter provided with the relay to make Port 123 appear the same as a PC's serial port. A standard modem-to-PC serial cable can then be used to connect the modem and the relay. For pin-out details see "Communication Port Details" on page 2-15.

Connect the modem to an analog telephone line or switch using a standard RJ-11 connector.

Configure the relay's Port 123 to work with a modem. Log into the relay through Relay Control Panel, go to *Utilities>Communication* and select *port 123*. Set the *Baud Rate* as high as possible – most modems handle 57,600 bps. The *Initialize* setting allows the user to set the control codes sent to the modem at the start of each connection session. The factory defaults are: "M0S0=0&B1" for an external modem and "M0S0=0" for an internal modem.

Internal

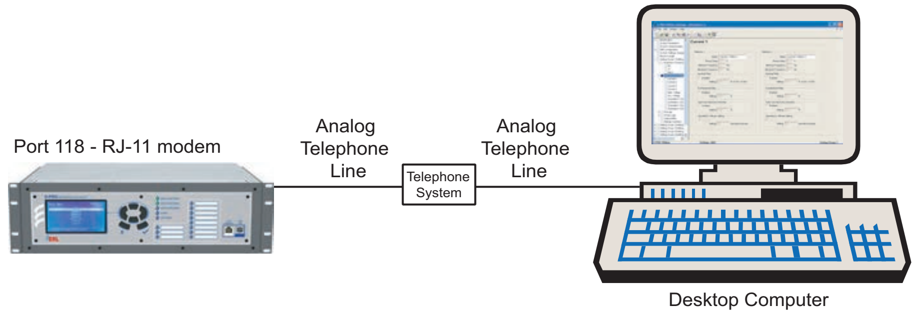


Figure 2.5: Internal Modem Link

Access the relay's user interface through a telephone link between the relay and the computer using an optional internal modem. If the modem has been installed, Port 118 on the rear panel is labelled "INTERNAL MODEM."

Connect the relay's Port 118 to an analog telephone line or switch using a standard RJ-11 connector.

When an internal modem is installed, the relay's Port 118 is used to interface to the modem internally. Appropriate Port 118 settings are configured at the factory when the internal modem is installed. The factory defaults are: "M0S0=0&B1" for an external modem and "M0S0=0" for an internal modem.

2.8 Using HyperTerminal to Access the Relay's Maintenance Menu

This section describes how to configure a standard Windows VT-100 terminal program on the PC for use with the relay.

The computer must be connected to the relay via the front USB port 150.

The relay is accessed using a standard VT-100 terminal style program on the computer, eliminating the need for specialized software. Any terminal program that fully supports VT-100 emulation and provides z-modem file transfer services can be used. The HyperTerminal program, which is included with Windows XP and is also available separately as HyperTerminal PE, is used here as an example.

Configure the terminal program as described in Table 2.1:Terminal Program Setup and link it to the appropriate serial port, modem or TCP/IP socket on the computer.

Table 2.1: Terminal Program Setup

Baud rate	Default fixed baud rate 115,200 N81 (no parity, 8 data bits, 1 stop bit).
Data bits	8
Parity	None
Stop bits	1
Flow control	Hardware or Software. Hardware flow control is recommended. The relay automatically supports both on all its serial ports.
Function, arrow and control keys	Terminal keys
Emulation	VT100
Font	Use a font that supports line drawing (e.g. Terminal or MS Line Draw). If the menu appears outlined in odd characters, the font selected is not supporting line drawing characters.

To configure HyperTerminal follow these instructions:

In Windows 7 open HyperTerminal PE; in Windows XP go to

Start > All Programs > Accessories > Communications > HyperTerminal

If "Default Telnet Program?" windows pops up,

Check "Don't ask me this question again"

Hit *No*.

First time use of HyperTerminal will ask for "Location Information".

Fill with appropriate information, e.g.:

"What country/region are you in now"
Choose "Canada"
"What area code (or city code) are you in now?"

Enter “306”
“If you need to specify a carrier code, what is it?”
Enter “”, i.e. leave blank
“If you dial a number to access an outside line, what is it?”
Enter “”.
“The phone system at this location uses:”
Choose “Tone dialing”.

Hit *OK*.

First time use of HyperTerminal will show “Phone and Modem Options”.

Hit *Cancel*.

HyperTerminal will show initially “Connection Description”.

Enter a name for the relay, e.g: “SPRO4001”.

Hit *OK*.

In the window “Connect To”

“Connect using”

Choose “COM#”, where “#” was obtained previously in Section 2.5 USB Link, after installing the USB driver.

Let’s assume in this case it is COM3.

In the window “COM3 Properties” choose:

“115200”
“8”
“None”
“1”
“Hardware”

Hit *Apply* then hit *OK*

At this time the connection should already be established.

Hit *Enter* in the terminal window.

Login as **maintenance** in lower case

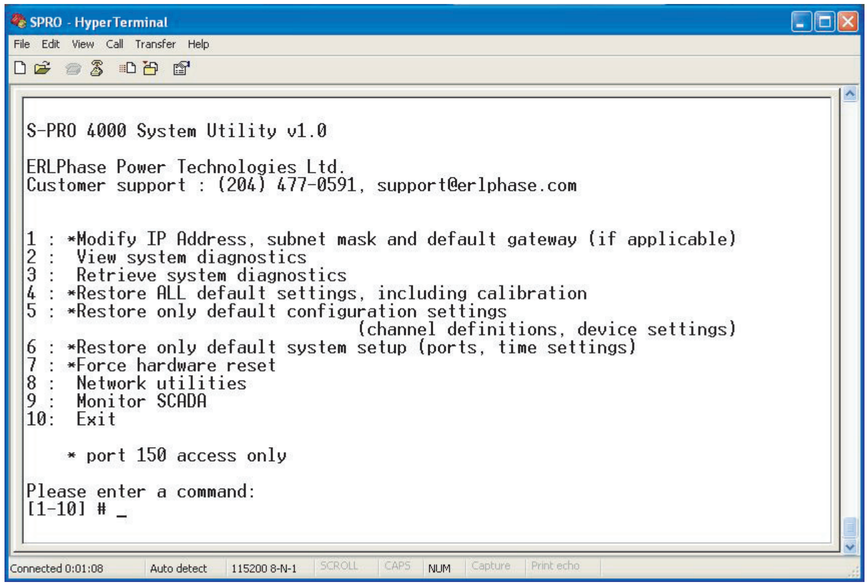


Figure 2.6: Maintenance Menu

Maintenance Menu Commands

Commands 1,4,5,6 and 7 are Port 150 access only.

Table 2.2: Maintenance Menu Commands	
Modify IP address	Modifies the LAN IP addresses, network mask, default gateway and IEC61850 network port assignment.
View system diagnostic	Displays the internal status log.
Retrieve system diagnos-tics	Automatically packages up the internal status log plus setting and setup information and downloads it in compressed form to the computer. This file can then be sent to our customer support to help diagnose a problem.
Restore settings (com-mands 4, 5 and 6)	Use these commands to force the system back to default values, if a problem is suspected due to the unit's settings, calibration and/or setup parameters.
Force hardware reset	Manually initiates a hardware reset. Note that the communication link is immediately lost and cannot be reestablished until the unit completes its start-up.
Network utilities	Enters network utilities sub-menu.
Monitor SCADA	Shows real time display of SCADA data.

Table 2.3: Network Utilities Menu Commands

View protocol statistics	View IP, TCP and UDP statistics
View active socket states	View current states of active sockets
View routing tables	View routing tables
Ping	Check network connection to given point
Exit network utilities	Exit network utilities menu and return to Maintenance Menu Commands

2.9 Firmware Update

The relay has an update login that can be accessed by a connection through a VT100 terminal emulator (such as HyperTerminal). This login is available only from Port 150.

1. Use the terminal program to connect to Port 150.
2. Select *Enter*, the terminal responds with a login prompt.
3. Login as **update** in lower case.

The firmware update is used to update the relay's software with maintenance or enhancement releases. Please see the S-PRO Firmware Update Procedure documentation that comes with the firmware update for instructions on how to update the firmware on the relay.

Note: The mouse does not work in VT100 terminal mode.

2.10 Setting the Baud Rate

> The baud rate is available on the LCD screen from the top level menu selecting System -> Relay Comm Setup.

Direct Serial Link

For a direct serial connection, both the relay and the computer must be set to the same baud rate.

To change the baud rate of a relay serial port:

1. The user needs to log into the relay as Change (any port) or Service (USB port only) using RCP.”
2. Then choose Utilities>Communication tab.

Modem Link

Unlike a direct serial link, the baud rates for a modem link do not have to be the same on the computer and on the relay. The modems automatically negotiate an optimal baud rate for their communication.

The baud rate set on the relay only affects the rate at which the relay communicates with the modem. Similarly, the baud rate set in HyperTerminal only affects the rate at which the computer communicates with its modem. Details on how to set these respective baud rates are described above, except that the user modifies the Port 123 baud rate on the relay and the properties of the modem in HyperTerminal.

2.11 Accessing the Relay’s SCADA Services

The relay supports DNP3 (Level 2) and Modbus SCADA protocols as a standard feature on all ERLPhase relays. DNP3 is available through a direct serial link or the Ethernet LAN on top of either TCP or UDP protocols. The Modbus implementation supports both Remote Terminal Unit (RTU) binary or ASCII modes and is available through a direct serial link.

The relay’s Port 122 is dedicated for use with Modbus or DNP3 serial protocols. Port 122 uses standard RS-232 signalling. An external RS-232<->RS-485 converter can also be used to connect to an RS-485 network.

For details on connecting to serial Port 122 see “Communicating with the Relay” on page 2-2 and “Communication Port Details” on page 2-15.

The DNP3 protocol can also be run across the Ethernet LAN. Both DNP over TCP and DNP over UDP are supported. For details on connecting to the Ethernet LAN see “Network Link” on page 2-5.

Complete details on the Modbus and DNP3 protocol services can be found in the Appendices, for details see “Modbus RTU Communication Protocol” in Appendix E. and “DNP3 Device Profile” in Appendix F.

Protocol Selection

To select the desired SCADA protocol go to S-PRO 4001 Offliner SCADA communications section. Select the protocol and set the corresponding parameters.

Communication Parameters

Port 122's communication parameters are set in the S-PRO 4001 Offliner SCADA communications section. Both the baud rate and the parity bit can be configured. The number of data bits and stop bits are determined automatically by the selected SCADA protocol. Modbus ASCII uses 7 data bits. Modbus RTU and DNP Serial use 8 data bits. All protocols use 1 stop bit except in the case where either Modbus protocol is used with no parity; this uses 2 stop bits, as defined in the Modbus standard.

Diagnostics

Protocol monitor utilities are available to assist in resolving SCADA communication difficulties such as incompatible baud rate or addressing. The utilities can be accessed through the Maintenance Menu Commands, see “Using HyperTerminal to Access the Relay’s Maintenance Menu” on page 2-9.

2.12 Communication Port Details

Table 2.4: Communication Port Details

Location	Port	Function
Front Panel	119	RJ-45 receptacle, 100BASE-T Ethernet interface. Default IP = 192.168.100.80. Same subnet as rear panel port 119. Used for user interface access or SCADA access through Ethernet LAN.
Front Panel	150	USB-B receptacle, High speed USB 2.0 interface Used for user interface access Default fixed baud rate 115,200 N81 (no parity, 8 data bits, 1 stop bit).
Rear Panel	118	RJ-11 receptacle, Internal modem interface. Default Baud rate 38,400 N81 (no parity, 8 data bits, 1 stop bit)
Rear Panel	119	RJ-45 receptacle or ST type optical receptacle (factory configured). 100BASE-T or 100BASE-FX (1300 nm, multimode) Ethernet interface. Same subnet as front panel port 119. Used for user interface access or DNP/IEC61850 SCADA access through Ethernet LAN.
Rear Panel	120	Rear panel, RJ-45 receptacle or ST type optical receptacle (factory configured). 100BASE-T or 100BASE-FX (1300nm, multimode) Ethernet interface. Used for user interface access or IEC61850/DNP SCADA access through Ethernet LAN.
Rear Panel	121	BNC receptacle, IRIG-B Interface. Modulated or un-modulated, 330 ohm impedance.
Rear Panel	122	RS-232 DCE female DB9. Used for SCADA communication. Default Setting: 19,200 baud O71 (odd parity, 7 data bits, 1 stop)
Rear Panel	123	RS-232 DCE female DB9. Used for: • User interface access through a direct serial connection. • Default Setting: 9600 baud N81 (no parity, 8 data bits, 1 stop bit). • User interface access through an external modem. The optional ERLPhase Modem Adapter converts this port to a Data Terminal Equipment (DTE) to simplify connection to an external modem.

Table 2.5: Signal connections to pins on Relay Port		
Signal Name	**Direction PC<-> Relay**	**Pin # on the Relay Port**
DCD	←	1
RxD	←	2
TxD	→	3
DTR	→	4
Common		5
DSR	←	6
RTS	→	7
CTS	←	8
No connection		9

Notes:
Relay is DCE, PC is DTE.
Pins 1 and 6 are tied together internal to the relay.

Table 2.6: Cable Pin Connections	
Male DB-9 Cable End for Relay Port	**Female DB-9 Cable End for Computer Port**
Pin # on Cable	Pin # on Cable
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Table 2.7: Signal name connections to pins on Modem Adapter		
Signal Name	**Direction Modem <-> Relay**	**Pin # on the Modem Adapter**
DCD	→	1
RxD	→	2
TxD	←	3
DTR	←	4
Common		5
DSR	→	6
RTS	←	7
CTS	→	8
No connection		9

Notes:
Relay (with modem adapter) is DTE, modem is DCE.
Pins 1 and 6 are tied together internal to the relay.

3 Using the IED (Getting Started)

3.1 Introduction

This section provides information on the start-up sequence and ways to interface with the relay. Descriptions of the Front Panel Display, Terminal Mode and Metering Data are provided.

3.2 Start-up Sequence

When the power supply is connected, the following initialization initializing sequence takes place:

Table 3.1: Initialization Sequence

TEST MODE — red LED on	when power applied
RELAY FUNCTIONAL — green LED on	within 5 seconds after power applied
TEST MODE — red LED off then on	within 10 seconds
Front Display — on	on within 20 seconds after power applied
TEST MODE — red LED off	within 20 seconds after power applied

When the Relay Functional LED comes on, it indicates that the DSP is actively protecting the system.

When the test mode LED goes off, the relay is capable of recording and communicating with the user.

3.3 Interfacing with the Relay

The following ways can be used to interface with the relay:

- Front panel display
- Terminal mode (for maintenance and firmware upgrade)
- Relay Control Panel

3.4 Front Panel Display

The front panel display is the fastest and easiest way of getting information from the relay.

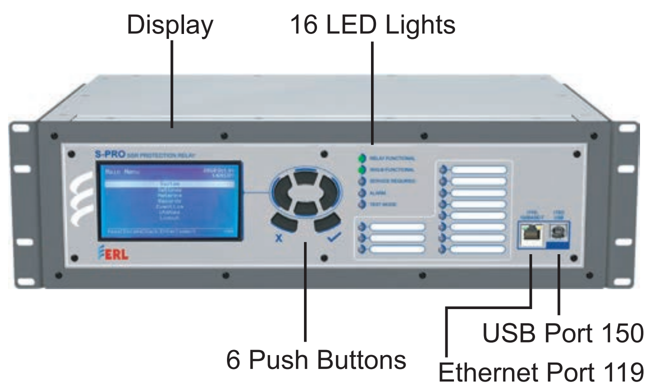


Figure 3.1: Front Panel Display

The display, the 16 LED lights and the 6 push buttons, provide selective information about the relay.

LED Lights

Table 3.2: Description of LED Lights	
Relay Functional	Indicates when the relay is functional. When the Relay Functional green LED goes on, the rear Relay Inoperative contact changes to an open and the protective functions become functional.
IRIG-B Functional	Indicates the presence of a valid IRIG-B time signal where the LED is on.
Service Required	Indicates the relay needs service. This LED can be the same state as the Relay Functional LED or can be of the opposite state depending on the nature of the problem. The following items bring up this LED: • DSP failure - protection difficulties within the relay. • Communication failure within the relay. • Internal relay problems.
Test Mode	Occurs when the relay output contacts are intentionally blocked. Possible reasons are: • Relay initialization on startup • User interface processor has reset and is being tested. The user cannot communicate with the relay through the ports until the front display becomes active and the TEST MODE LED goes out. Normally, the red Target LED remains off after this start-up unless the relay had unviewed target messages.
Alarm	Occurs when an enabled relay function picks up. The red Alarm LED should be off if there are no inputs to the relay. If the Alarm LED is on, check the event log messages which are available through the menu system.
Target LED Number	**Description (Default values)**

Table 3.2: Description of LED Lights	
1	Device 27 Main and Auxiliary trip operation
2	Device 59 Main and Auxiliary trip operation
3	Device 50LS Current 1-4 trip operation
4	Device 50LS Summation 1-4 trip operation
5	Device SHD1-2 Current 1-4 trip operation
6	Device SHD1-2 Main and Auxiliary Voltage trip operation
7	Device SHD1-2 Summation 1-4 trip operation
8	ProLogic 1-8 trip operation
9	ProLogic 9-16 trip operation
10	ProLogic 17-24 trip operation
11	Spare (not used in default configuration)

Target LED assignments are the default values but are configurable by the user through the Offliner settings (output matrix configuration).

Push Buttons

Table 3.3: Identification of Push Buttons	
Up, Down, Right, Left, Enter, Escape	Used to navigate the front panel screens.

Display

The basic menu structure for navigation of the LCD screen is given below:

Table 3.4: Navigation of the LCD Screen

Main Screen						
	View / Change / Service: Choice Menu					
		Enter Password				
		Main Menu				(V)
			System			(V)
				Relay Identification		(V)
				Relay Comm Setup		(V)
			Metering			(V)
				Analog		(V)
					Analog Inputs	(V)
					Summation	(V)
					Power	(V)
				External Inputs		(V)
				Output Contacts		(V)
				Logic		(V)
					Logic Protections 1	(V)
					Logic Protections 2	(V)
					Logic Protections 3	(V)
					Logic Protections 4	(V)
					ProLogic	(V)
					Settings Group	(V)
					Virtual Inputs	(V)
			Records			(V)
				View Record List		(V)
				Fault Recording		(C,S)
				Swing Recording		(C,S)
				Event Recording		(C,S)
			Event Log			(V)
			Fault Log			(V)
			Utilities			(V)
				Setup		(V)
					Timeouts	(V)

Table 3.4: Navigation of the LCD Screen

		Time Settings		(V)
		Set Manual Time		(V)
		Set DST Time		(V)
		External Inputs		(V)
	Maintenance			(V)
		Output Contacts Control		(S)
		Virtual Inputs Control		(C,S)
		Setting Groups Control		(C,S)
		Erase		(C,S)
			Erase Records	(C,S)
			Erase Event Logs	(C,S)
	Network			(V)
		Network Protocol Stats		(V)
		Active Sockets		(V)
		Routing Tables		(V)
		Ping		(V)
Logout				(V)

Where the access levels required to access each are indicated by:

V: view

C: change

S: service

To login into the LCD menu structure, follow these steps:

Figure 3.2: Main Screen

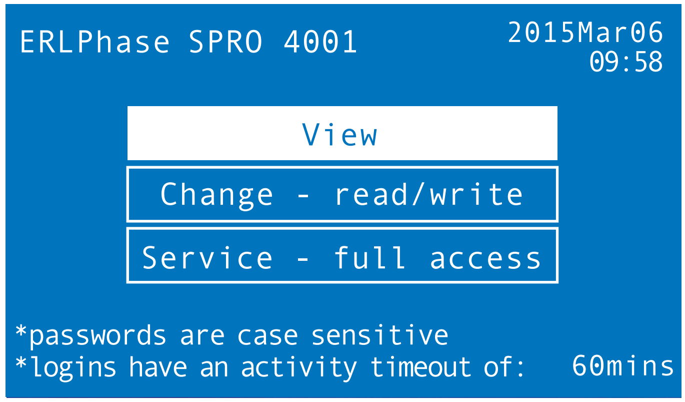


Figure 3.3: View / Change / Service: Choice Menu

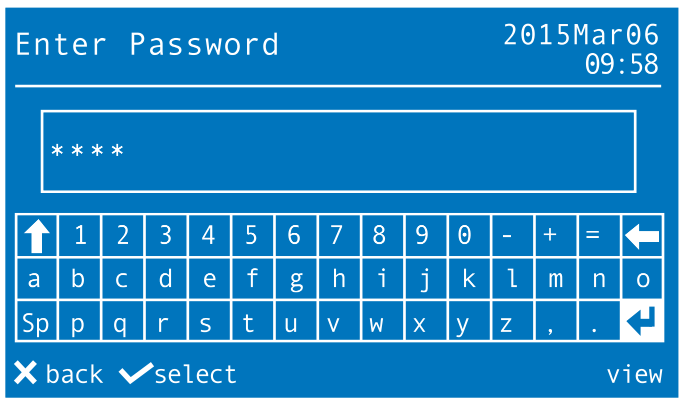


Figure 3.4: Enter Password

In the Main Screen, hit Enter

In the View / Change / Service: Choice Menu screen, choose desired access level, hit Enter

In the Enter Password screen, enter appropriate password, hit Enter on the Return character (right bottom one)

The Main Menu screen should appear.

Note: The default passwords are (remove quotation marks)

View Access “view”
Change Access “change”
Service Access “service”

3.5 Terminal Mode

The terminal mode is used to access the relay for maintenance functions see "Using HyperTerminal to Access the Relay's Maintenance Menu" on page 2-9 and "Firmware Update" on page 2-12.

3.6 Relay Control Panel

RCP is used for all user interface. A short description of the RCP configuration to connect to a relay is given here. Please refer to the Relay Control Panel User Manual for further details.

Follow this sequence to configure RCP for USB link to the relay.

1. Execute.

   Relay Control Panel.exe
2. Execute.

   S-PRO 4000 Offliner.exe
3. Install Null Modem Driver.

   Please refer to the Relay Control Panel User Manual for details.
4. Run Relay Control Panel.

   Go to:

   Start > All Programs > ERLPhase > Relay Control Panel > Relay Control Panel

   First time RCP is run.

   Hit *Add New*.

   "Add New Relay"
   Choose Communication > Direct Serial Link.
   Hit *Get Information From Relay.*

   > Then RCP will communicate with the SPRO4001 and retrieve information to fill required fields.
   >
   > When this is done, hit *Save Relay*.
   >
   > > If the window "Relay already exists..." pops up, you may need to rename the relay changing the "Relay Name" in the "Relay Definition" category, before saving.

   After first time, in "Select Relay", choose relay and hit *Connect*.

   In "Relay Password Prompt"
   Choose desired access level, enter appropriate password
   Note: Default passwords are listed below (remove the quotation marks)

   > View Access "view"
   >
   > Change Access "change"
   >
   > Service Access "service"

The basic structure of the Relay Control Panel information, including basic actions available, is given below:

Table 3.5: Relay Control Panel Structure

		View	Change	Service
Relay Control Panel				
Records			Trigger Fault	Trigger Fault
			Trigger Swing	Trigger Swing
			Trigger Event	Trigger Event
Events			Erase	Erase
Metering				
	Analog			
	Summations			
	Power			
	MV Subharmonics			
	AV Subharmonics			
	I1 Subharmonics			
	I2 Subharmonics			
	I3 Subharmonics			
	I4 Subharmonics			
	Sum1 Subharmonics			
	Sum2 Subharmonics			
	Sum3 Subharmonics			
	Sum4 Subharmonics			
	External			
	SHD			
	Protection			
	ProLogic			
	Outputs			
	Group Logic			
	Virtual			
Utilities				
	Unit Identification			
	Communication			

Table 3.5: Relay Control Panel Structure				
	Time			
	Analog Input Calibration	N/A	N/A	
	External Input			
	Virtual Inputs	N/A	Latch/Pulse	Latch/Pulse
	Toggle Outputs	N/A	N/A	Close/Open
	Settings Group		Save	Save
	SHD Pickup Counters	N/A	N/A	
	Passwords	N/A	N/A	
	Configuration			
	Present Settings	(Get From Relay)		
	Saved Settings		(Load to Relay)	(Load to Relay)

Notice that some options are not available (N/A) depending on the access level.

4 Protection and Recording Functions

Introduction

This section explains the S-PRO functions and how it is used on the power system. The S-PRO relay's function is to detect low frequency components of power system currents and voltages.

Normally, power systems operate at 50 or 60 Hz, which results in currents and voltages at this same frequency. Occasionally, system disturbances can occur in which low frequency oscillations in the system voltages and currents can occur. The oscillations can be caused by interactions between control devices such as generator excitation systems, governors or other controllers.

A complete list of the settings and their range values can be found in “Settings and Ranges” in Appendix B..

On the other hand, switching devices such as thyristors with their current chopping action can create harmonics on the power system, usually in the range of the 5^{th} to the 13^{th} harmonic.

In some cases, interaction between generation sources such as wind turbines and thermal fossil fuelled generators in operation with transmission line series capacitors can resonate to produce low frequency oscillations in power system quantities in the range of 5 to 45/55 Hz. These resonances are known in the industry as *Sub Synchronous Resonances*. If left unchecked, the low frequency quantities can excite mechanical resonances in generator turbine shafts and can cause catastrophic failure of mechanical components.

The S-PRO relay, is considered by groups such as NERC (North American Reliability Council) as a Special Protection System (SPS) since it is intended to deal with a special specific system problem.

4.1 S-PRO Features

The S-PRO relay performs the following activities.

1. Takes in current and voltages from the power system elements such as transmission lines and generators. S-PRO has the ability to take in four 3-phase sets of currents plus 2 sets of 3-phase-to-neutral voltages. In addition a total of 4 sets of configurable 3-phase current summation virtual channels are also monitored. These virtual channels allow 2 sets of 3-phase currents to be added together to form a line current suitable for ring bus configuration.
2. S-PRO can detect low frequency components on the ac input currents and voltages in the range of 5 to 45/55 Hz. This detection of specific frequencies or bands of frequencies and magnitudes are user selectable. Once detected, these quantities can be set to provide the user with indications, alarms or can be set to provide output contact closures. In addition, the detection of these low frequency current and voltage components can also be set to initiate recordings of these quantities for further system analysis.

3. In order to detect low frequency components in elements such as lines in ring bus conditions, S-PRO has the ability to sum two sets of currents. This summation can then be user set to detect low frequency components such as lines.
4. In addition to the low frequency recording capability, S-PRO can provide fault recording with harmonics up to the 25^{th} harmonic for the input currents and voltages.

4.2 S-PRO Protection Functions

The S-PRO relay has the ability to provide protection for abnormal system conditions. The functions available to the user for applications are:

1. Definite time delay overcurrent (50LS) functions on each of the current inputs.
2. Definite time delay undervoltage (27) function for the Main voltage input.
3. Definite time delay undervoltage (27) function for the Aux. voltage input.
4. Definite time delay overvoltage (59) function for the Main voltage input.
5. Definite time delay overvoltage (59) function for the Aux voltage input.
6. SubHarmonic detector and level (two of them) for input current 1
7. SubHarmonic detector and level (two of them) for input current 2
8. SubHarmonic detector and level (two of them) for input current 3
9. SubHarmonic detector and level (two of them) for input current 4
10. SubHarmonic detector and level (two of them) for summation current 1
11. SubHarmonic detector and level (two of them) for summation current 2
12. SubHarmonic detector and level (two of them) for summation current 3
13. SubHarmonic detector and level (two of them) for summation current 4
14. SubHarmonic detector and level (two of them) for the Main Voltage
15. SubHarmonic detector and level (two of them) for the Aux Voltage
16. ProLogic functions (twenty four of them) to combine protection functions.

Device 50LS

Each of the current input quantities and current summation channels can be set to initiate its definite time overcurrent device 50LS. The overcurrent device has a setting range of 0.1 to 50 A rms secondary.

Device 27

The voltages on the Main or Aux inputs can have a definite time delay under voltage function applied.

Device 59

The voltages on the Main or Aux inputs can have a definite time delay over voltage function applied.

Sub- Harmonic Detectors

Each ac voltage and current input to the S-PRO has 2 definite time delay level detectors. Each of the summated virtual channels also has 2 sub-harmonic detectors associated with them. These detectors can be set to close a contact, pro-

vide an alarm or trigger a recording. The detectors can be set to respond to frequencies in the 5-40 Hz range

4.3 Description Of The S-PRO Logic

S-PRO is a microprocessor based device that can take in four sets power system alternating current 3-phase currents and two sets of 3-phase voltages from current and voltage transformers. Two sets of level detectors can be set for each input quantity to detect specific frequency components in the 5 to 45/55 Hz range or to detect ranges of frequencies over this range. S-PRO also has the ability to sum quantities from say two current transformers on a ring bus that might represent the current as seem on a particular line, and then apply the level detectors to these summated quantities. S-PRO also has recording triggering capability to alarm or take action for cyclical sub-harmonic quantities that may be oscillating just below the tripping levels. The intention here is to collect subharmonic data as it occurs even if it is on the verge of being a problem. User setting of the pickup levels and the time delays of the detectors and action that is taken, is fully selectable. For completeness, S-PRO also has the ability to collect and store fault and harmonic voltage and current quantities. S-PRO samples the input quantities at 96 samples per cycle (60 Hz or 50 Hz system), so with its anti aliasing filtering, up to the 25^{th} harmonic on the input quantities is made available. In this way, a complete synopsis of power system data is collected for further studies by the user. All detector and event operations are time tagged and presented in a log. IRIG-B time synchronization is possible through connection of S-PRO to a time clock satellite receiver. All information and data collected can be retrieved remotely or from the USB on the front of the S-PRO. Figure 4.1: Block Diagram of the Microprocessor Based Sub-Harmonic Protection Relay shows the block diagram of the proposed micro processor based S-PRO Relay.

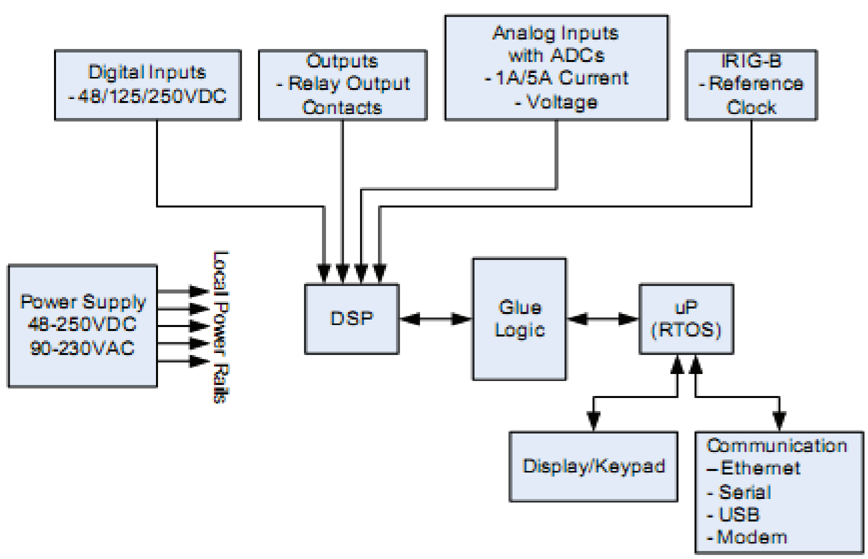
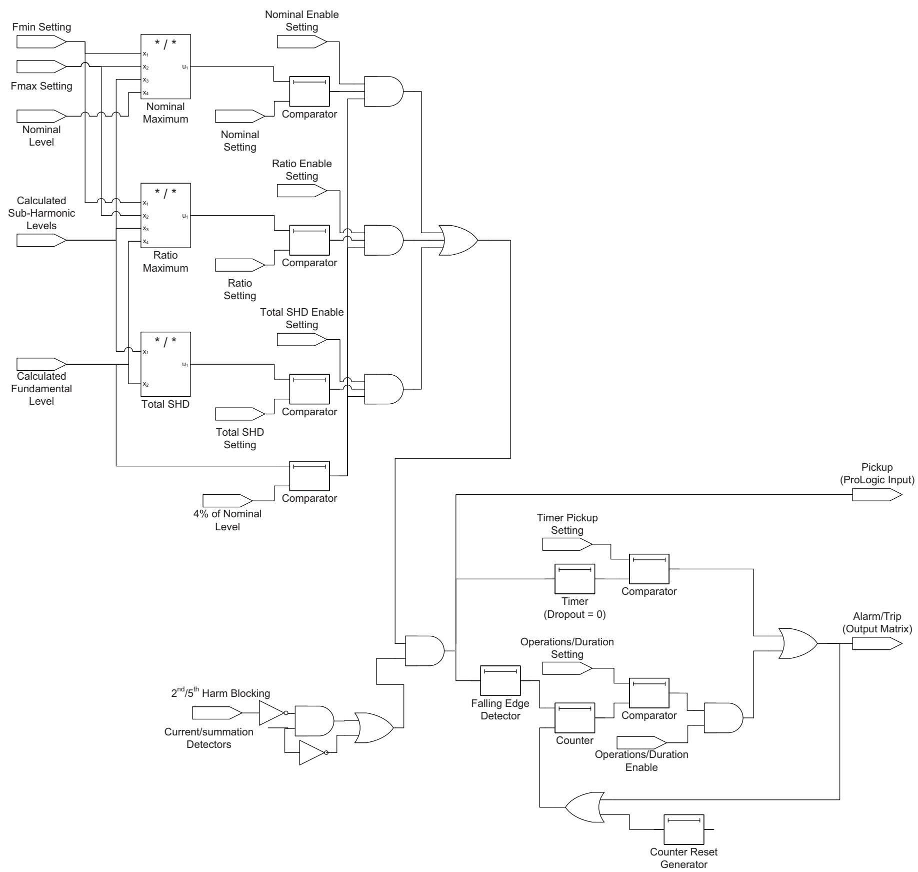


Figure 4.1: Block Diagram of the Microprocessor Based Sub-Harmonic Protection Relay

S-PRO Principle of Sub-Harmonic Quantities Measurement and Detection

The logic used by S-PRO to measure the sub-harmonic input quantities is shown in Figure 4.2: Sub-Harmonic Measurement and Detection Logic on page 4-4.



<u>Settings:</u>
[Nominal | Ratio | Total SHD | Operations/Duration] Enable Settings: true/false, default = false
Fmin Setting: 5 Hz to 45/55 Hz, 1 Hz step, 5 Hz default, Fmin <= Fmax
Fmax Setting: 5 Hz to 45/55 Hz, 1 Hz step, 25 Hz default, Fmax >= Fmin
Nominal Setting: % of nominal level from Fmin to Fmax
- 1% to 200% (1A/5A for currents), 1% step, 100% default
- 1% to 15% (69V for voltages), 1% step, 5% default

Ratio Setting: % of fundamental level from Fmin to Fmax
- 1% to 200% (1A/5A for currents), 1% step, 100% default
- 1% to 15% (69V for voltages), 1% step, 5% default

Total SHD Setting:
- 1% to 200% (1A/5A for currents), 1% step, 100% default
- 1% to 15% (69V for voltages), 1% step, 5% default

Total SHD = sqrt(sq(5 Hz level) + … + sq(45/55 Hz level)) / fundamental level
Timer Pickup Setting: 0.000 to 999.000 seconds, 0.001 second step, 10.000 second default
Operations/Duration Setting: Enable Settings: true/false, default = false
- Duration: 1 to 60 minutes, 1 minute steps, 1 minute default
- 1 to 30*duration operations/duration, 1 operation/duration step, 20 operation/duration default

2nd Harmonic Blocking Setting: Enable Settings: true/false, default = false
- 1% to 200% (1A/5A for currents), 1% step, 20% default
- Cross Blocking: true/false, default = true

5th Harmonic Blocking Setting: Enable Settings: true/false, default = false
- 1% to 200% (1A/5A for currents), 1% step, 20% default
- Cross Blocking: true/false, default = true

Figure 4.2: Sub-Harmonic Measurement and Detection Logic

The principle used in detecting the sub-harmonic is known as the Real time Fourier Transform or Recursive Fourier Transform (RFT). The digital data available after the Analog to Digital Conversion for each voltage and current channel is evaluated based on the following algorithm to track the sub-harmonic frequencies in the range between 5 Hz to 45/55 Hz, with 1 second window. The resolution is 1 Hz. The digital RFT is evaluated in real time for all the input channels (4 sets of 3-phase currents, 2 sets of 3-phase voltages, and 4 sets of 3-phase summated currents). The user can also set a band or group of sub-harmonic frequencies for Nominal or Ratio detectors. The Total sub-harmonic Detector (TSHD) will be calculated for the 5 Hz – 45/55 Hz range of sub-harmonics with respect to the fundamental. There is a special detector used to track the sub-harmonic occurrence in Operations/Duration just below the threshold limit, which cannot be tracked by the other two detectors. The functional logic diagram of the sub-harmonic detection relay is shown in Figure 4.2: Sub-Harmonic Measurement and Detection Logic on page 4-4.

4.4 Recording Functions

Introduction

The relay has high speed fault recording and logging functions to allow the user to analyze faults and to review the operation of the overall protection scheme. Slow speed swing recording can be used to analyze system stability. If the relay has reached its recording capacity, new records overwrite the oldest records.

Fault Recording

The relay provides DFR-quality fault recording, capturing input signal waveforms and external input states at a rate of 96 samples per cycle. Each record also contains the timing of the internal logic produced by the relay (e.g. Device 50 LS). Obtain this information by uploading the records from the relay via the Relay Control Panel file transfer process and view them with RecordBase View software.

The quantities recorded are:

- 18 analog channels (6 voltages and 12 currents) @ 96 samples/cycle which captures up to the 25th harmonic
- External inputs @ 1 ms resolution
- Protection element output signals @ 8 samples/cycle
- ProLogic signals @ 8 samples/cycle
- Active setting group

The recorded protection element output signals includes Phase segregated Trip signals of the 27 and 59 functions.

Parameters that are user-selectable with respect to recording transients:

- Record length (0.2 to 10.0 seconds => 12 to 600 cycles @ 60 Hz Base) with automatic extension to capture successive triggers
- Recorder triggering by any internal logic or external input signal

- Pre trigger time configurable between 0.10 to 2.00 seconds

Swing Recording

The relay records dynamic system responses allowing the user to analyze system stability and to provide a larger context for fault analysis. Swing records contain positive sequence phasor measurements and system frequency calculated at a rate of 1 phasor per cycle. Swing records can extend to 2 minutes in duration.

The quantities recorded are:

- I1 – I2 (magnitude and angles)
- Main/Aux Voltages (magnitude and angles)
- Sum1 – 4 (magnitude and angles)

Event Recording

The event recording provides permanent storage for the event log. The user can create an event record automatically or manually. When the event auto save is enabled, an event record is created approximately every 250 events.

The user can initiate an event manually through the Relay Control Panel.

Record Initiation

Recording can be initiated automatically by the relay when a fault or abnormal condition is detected. Set the relay to initiate a fault record on activation of any of its trip or alarm functions or on assertion of any external digital inputs.

The assignment of fault record initiation to the various relay functions is done through the relay's Output Matrix settings.

A recording can also be initiated manually through the Relay Control Panel.

The commands Trigger Fault, Trigger Swing and Trigger Event are available under the following path:

Relay Control Panel > Records

Also the relay display provides the option to initiate Fault Recording, under the following path:

Main Menu > Records > Fault Recording

> A swing record can take a couple of minutes to produce due to the long post-trigger time.

Duration and Extension

The length of each record is determined by the Record Length setting. Transient record lengths can be set between 0.2 and 10.0 seconds; swing record lengths can be set between 60 and 120 seconds. Pre-trigger times are configurable between 0.10 to 2.00 seconds for transient records and fixed at 30 seconds for swing records and are included as part of the normal record length.

The relay automatically extends a record as required to capture consecutive triggers that are close together. If a trigger occurs while a recording is in progress, the record is extended to include the full post-trigger time of subsequent

triggers, up to a maximum length – 12.0 seconds for transient records; 180 seconds for swing records. If a trigger occurs before the end of a record caused by a previous trigger, but too late to allow sufficient post-trigger time in a maximum extended record, a new overlapping record is created.

The normal record length settings are accessible under the Record Length heading of the relay settings, and can be set with the Offliner Settings software.

Record Storage

The relay compresses records on the fly, achieving a typical lossless compression rate of 4:1. As a result, the relay can store up to 75 x 2 second transient records, or up to 75 x 120 seconds swing records, or a combination of 75 transient, swing and optionally event records. If the storage is full, new records automatically overwrite.

Record Retrieval and Deletion

A listing of stored records is available through the Relay Control Panel under the *Records* > *List* menu. The listing transfers records to a connected PC and deletes them from storage.

4.5 Event Log

The relay maintains a log of events in a 250 entry circular log. Each entry contains the time of the event plus an event description. Logged events include trips, alarms, external input assertions plus internal events such as setting changes. Phase information is included in event messages where appropriate. For example, the event log entry for a device trip might be:

2010 Nov 21, 15:34:19.832: 50LS ABC Trip

The event log can be viewed in 3 ways:

Front Panel:

- The front panel display shows events in abbreviated form (Trip and Alarm events only).

Relay Control Panel:

- The full event log is available through the *Main Menu* > *Events* of the Relay Control Panel

SCADA:

- The protocols included in the relay allow all the SCADA master access to the event data from the relay (Trip and Alarm events only).

> This display is a snapshot of the event list which must be manually refreshed to display new events that occur while the display is up.

There is a list of Event Messages, for details see “Event Messages” in Appendix D.

4.6 Fault Log

The S-PRO stores a log of faults in a 100 entry circular log. Each entry contains the time of the fault, fault type, faulted phase, fault quantities as per the below table. Fault log will be triggered only for trip condition and it won’t log for an alarm condition.

Table 4.6: Fault Log

50LS functions	Corresponding IA/IB/IC Phasors
27/59	Corresponding VA/VB/VC Phasors
Sub-harmonic defectors	Phase A Max Sub Harmonic Magnitude and Frequency Phase B Max Sub Harmonic Magnitude and Frequency Phase C Max Sub Harmonic Magnitude and Frequency Phase A TSHD Phase B TSHD Phase C TSHD Phase A type (nominal, fundamental, TSHD) Phase B type (nominal, fundamental, TSHD) Phase C type (nominal, fundamental, TSHD) Phase A Fundamental Magnitude Phase B Fundamental Magnitude Phase C Fundamental Magnitude

The fault log can be viewed in three ways:

- Relay Front HMI
- Relay Control Panel interface is in the Events tab
- 61850 SCADA protocol included in the S-PRO allow the SCADA client access to Trip event data

5 Data Communications

5.1 Introduction

Section 5 deals with data communications with the relay. First, the SCADA protocol is discussed, and it is then followed by the new IEC 61850 communication standard.

The SCADA protocol deals with the Modbus and DNP (Distributed Network Protocol) protocols. The SCADA configuration and its settings are described. The parameters for SCADA communications are defined using S-PRO 4000 Offliner software. Finally, details on how to monitor SCADA communications are given for maintenance and trouble shooting of the relay.

5.2 SCADA Protocol

Modbus Protocol

The relay supports either a Modbus RTU or Modbus ASCII SCADA connection. Modbus is available exclusively via a direct serial link. Serial Modbus communications can be utilized exclusively via serial Port 122 are an RS-232 DCE DB9F port located on the back of the relay. An external RS-232 to RS-485 converter can be used to connect the relay to an RS-485 network. For details on connecting to serial Port, see “Communicating with the Relay” on page 2-2 and “Communication Port Details” on page 2-15.

The data points available for Modbus SCADA interface are fixed and are not selectable by the user. Complete details regarding the Modbus protocol emulation and data point lists can be found in “Modbus RTU Communication Protocol” in Appendix E..

DNP Protocol

The relay supports a DNP3 (Level 2) SCADA connection. DNP3 is available via a direct serial link or an Ethernet LAN connection using either TCP or UDP.

Serial DNP communications can be utilized exclusively via serial Port 122. Port 122 is an RS-232 DCE DB9F port located on the back of the relay. An external RS-232 to RS-485 converter can be used to connect the relay to an RS-485 network. For details on connecting to serial Port, see “Communicating with the Relay” on page 2-2 and “Communication Port Details” on page 2-15.

Network DNP communications can be utilized via physical LAN Port 119 or Port 120. Port 119 is available as a pair of RJ-45 ports, one on the front of the relay and one on the rear. Port 120 is an ST fiber optic port located on the rear of the relay. DNP communications can be used with multiple masters when it is utilized with TCP. For details on connecting to the Ethernet LAN, see “Network Link” on page 2-5.

The data points available for DNP SCADA interface are user configurable. Complete details regarding the DNP3 protocol emulation and data point lists can be found in “DNP3 Device Profile” in Appendix F.

SCADA Configuration and Settings

The parameters for SCADA communications may be defined using S-PRO 4000 Offliner.

If DNP3 LAN/WAN communications were chosen, the relay's network parameters need to be defined. This is done via the Maintenance interface. Note that this effort may already have been completed as part of the steps taken to establish a network maintenance connection to the relay.

1. Establish a TUI session with the relay and login as **maintenance**. The following screen appears.

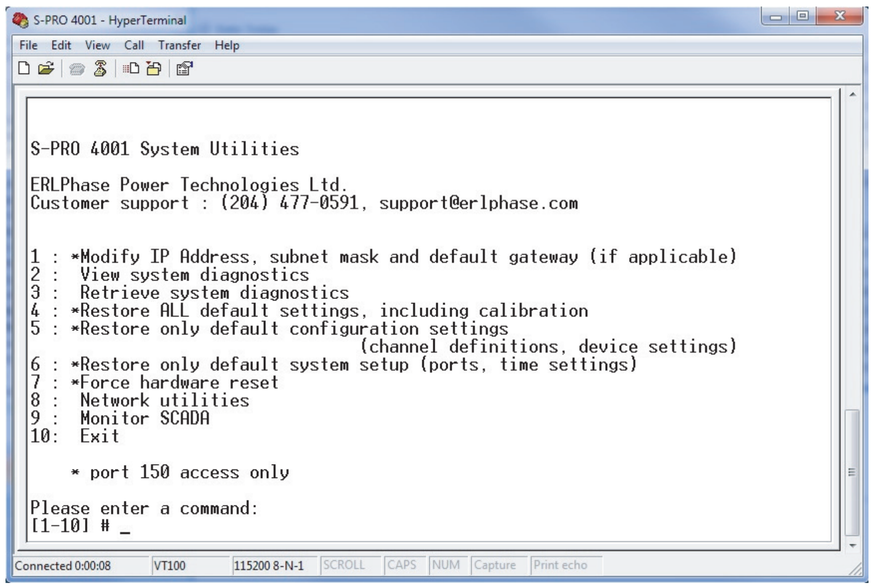


Figure 5.1: S-PRO 4001 System Utility

2. Select the first option by entering the number **1** followed by *Enter*. The following screen appears.

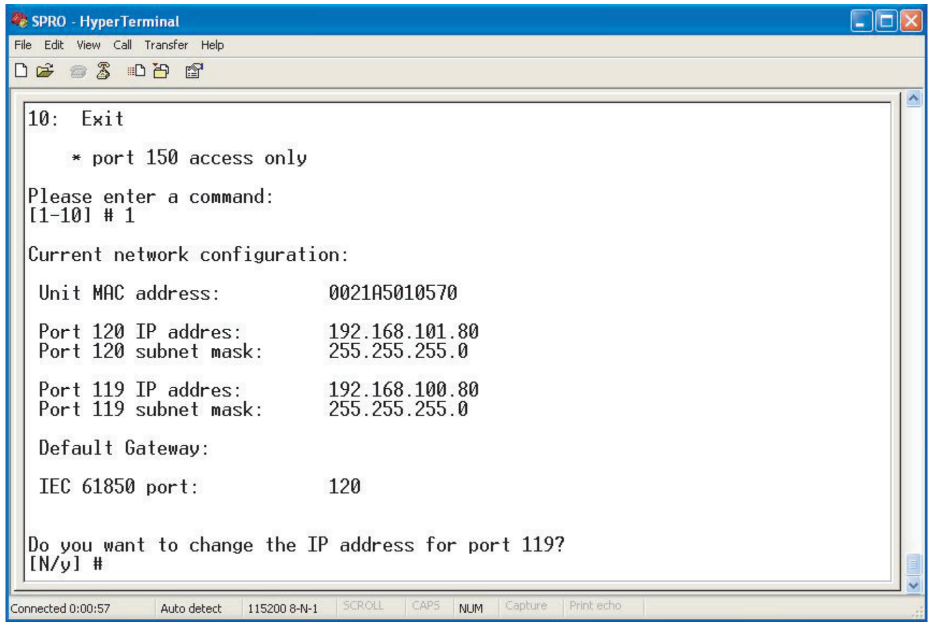


Figure 5.2: Change the network parameters as needed for the particular application

Offliner SCADA Configuration

Details on using the Offliner software are available in “To Install Software on the Computer” on page -xiii.

Open the Offliner application according to the instructions found in the indicated section and highlight the SCADA Communication selection. The screen appears as follows.

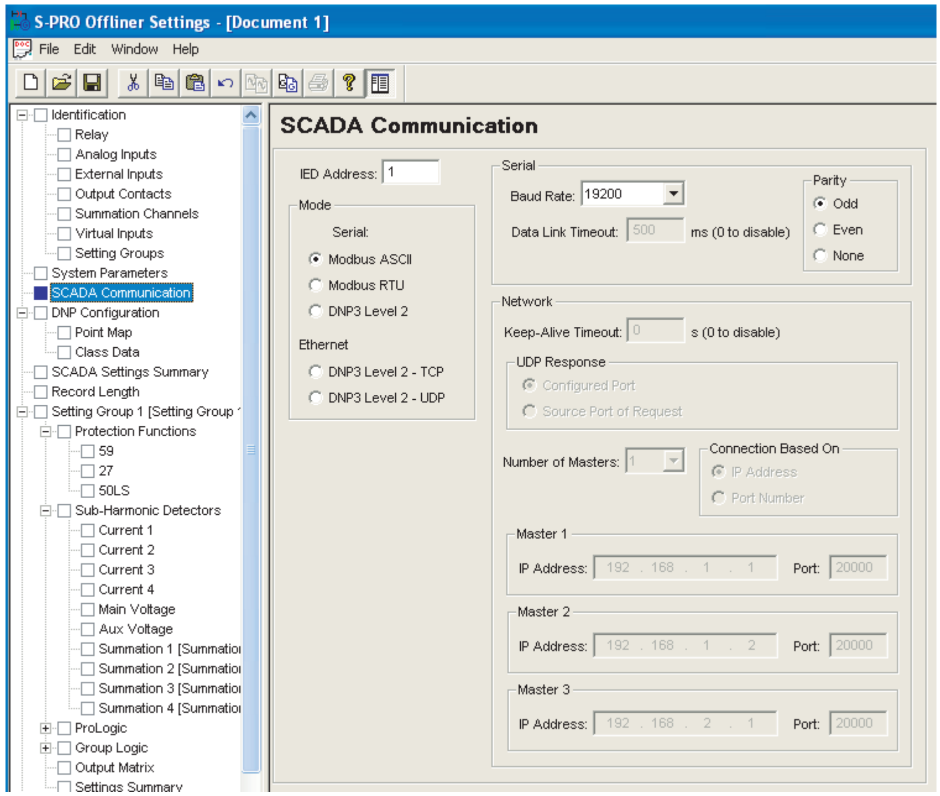


Figure 5.3: SCADA Communications

The configuration of SCADA communication parameters via the Offliner application is very intuitive. Several settings options are progressively visible and available depending on other selections. As noted before, there is no field to configure the number of data and stop bits. These values are fixed as follows:

- Modbus Serial – 7 data bits, 1 stop bit
- DNP Serial – 8 data bits, 1 stop bit

Monitoring SCADA Communications

The ability to monitor SCADA communications directly can be a valuable commissioning and troubleshooting tool. It assists in resolving SCADA communication difficulties such as incompatible baud rate or addressing. The utility are accessed through the Maintenance user interface, “” on page 2-17.

1. Establish a TUI session with the relay and login as **maintenance**.
2. Select option 9 by entering the number **9** followed by *Enter*. The following screen appears.

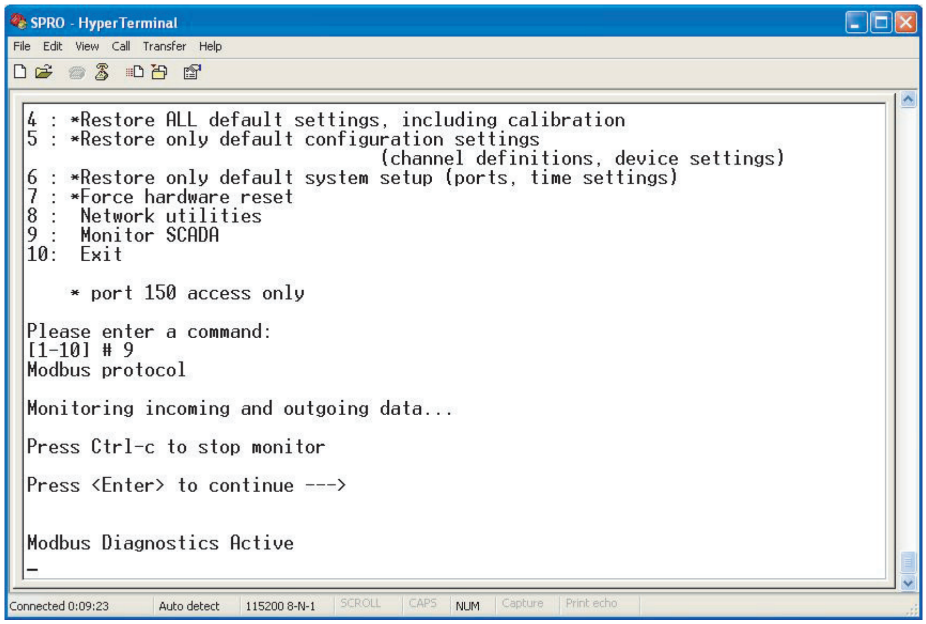


Figure 5.4: Login Screen

3. Pressing the *Enter* key results in all SCADA communications characters to be displayed as hexadecimal characters. Individual exchanges are separated by an asterisk as the following sample illustrates.

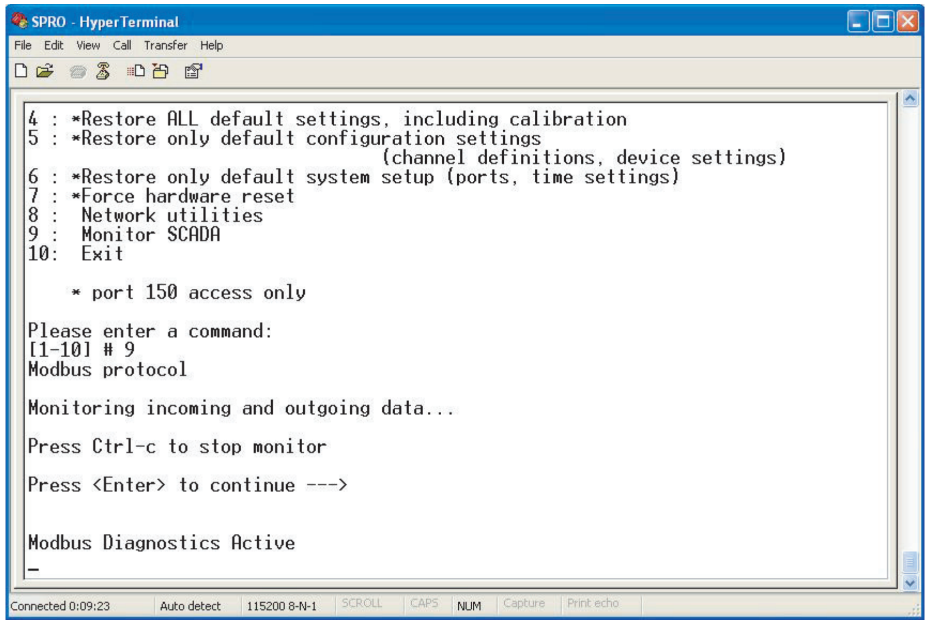


Figure 5.5: Hyperterminal

4. Press *Ctrl-C* to end the monitor session.

5.3 IEC 61850 Communication

The IEC 61850 Standard

The Smart Grid is transforming the electrical power industry by using digital technology to deliver electricity in a more intelligent, efficient and controlled way. Embedded control and communication devices are central to this transformation by adding intelligent automation to electrical networks.

The IEC 61850 standard defines a new protocol that permits substation equipment to communicate with each other. Like many other well-known manufacturers, ERLPhase Power Technologies is dedicated to using IEC 61850-based devices that can be used as part of an open and versatile communications network for substation automation.

The IEC 61850 defines an Ethernet-based protocol used in substations for data communication. Substations implement a number of controllers for protection, measurement, detection, alarms, and monitoring. System implementation is often slowed down by the fact that the controllers produced by different manufacturers are incompatible, since they do not support the same communication protocols. The problems associated with this incompatibility are quite serious, and result in increased costs for protocol integration and system maintenance.

Implementation Details

The S-PRO 4001 conforms to IEC 61850-8-1, commonly referred to as Station Bus Protocol. Implementation includes the following documents (“IEC61850 Implementation” in Appendix N.):

- Protocol Implementation Conformance Statement
- Model Implementation Conformance Statement
- Tissues Conformance Statement

All configurable IEC61850 parameters are available via the Maintenance interface. Note that this effort may already have been completed as part of the steps taken to establish a network maintenance connection to the relay.

1. Establish a TUI session with the relay and login as maintenance. The following screen appears.

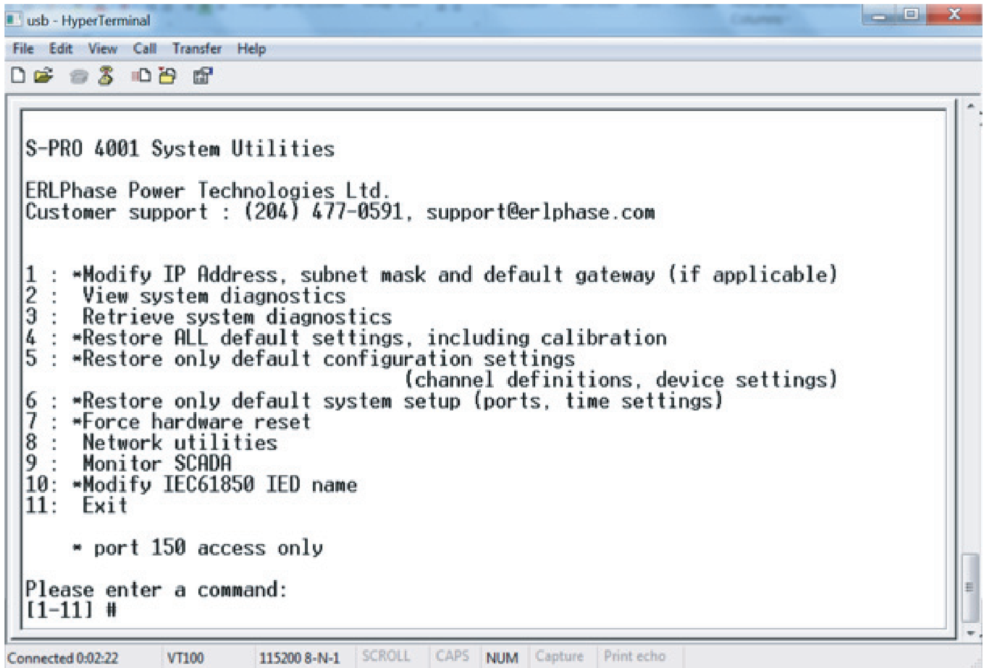


Figure 5.6: Maintenance Interface

2. Select the first option by entering the number *1* followed by <*Enter*>. The following screen appears.

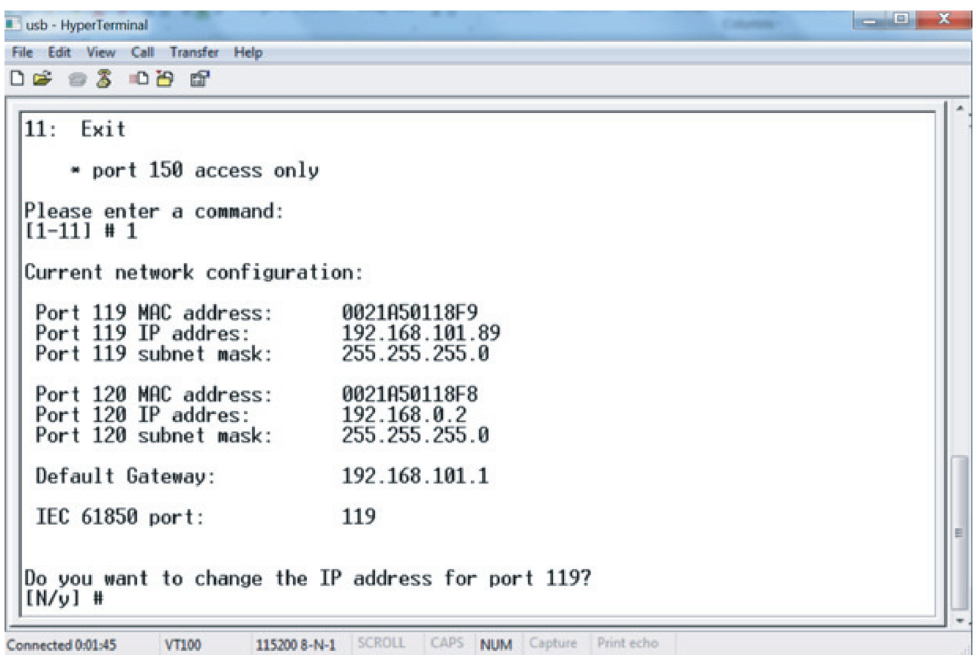


Figure 5.7: Change the network parameters

Note that unit's IP address can be used on the IEC61850 client side for unique unit identification instead of a physical device "PD Name". The publisher configuration is fixed and defined in the ICD file and available for reading to any IEC61850 client. Subscriber functionality is also fixed and supported for the Virtual Inputs only.

6 Offliner Settings Software

6.1 Introduction

This section deals with the Offliner Settings software. The Offliner settings software is used to create relay settings on a personal computer. Offliner provides an easy way to view and manipulate settings. Offliner supports all firmware versions and has the capability to convert older setting versions into newer ones.

In this section, first, the Offliner features are presented. The menu and toolbar are discussed and this is followed by a description of the Graphing and Protection functions.

Next, the Offliner features for handling backward compatibility with previous software versions is described. Also described are methods of converting a Settings File, sending a new Settings File to the relay and creating a Settings File from an older version of the software.

Next, the RecordBase View and RecordGraph to analyze the records from a relay are described.

This is followed by a lengthy description of the main branches from the Tree View. This section provides all information for Identification, System Parameters, SCADA Communication, DNP Configuration, SCADA Settings summary, Record Length, Setting Groups, ProLogic, Group Logic, Output Matrix and Settings summary.

Finally, a description of how the settings on the relay can be viewed through the RecordBase View analysis software is provided.

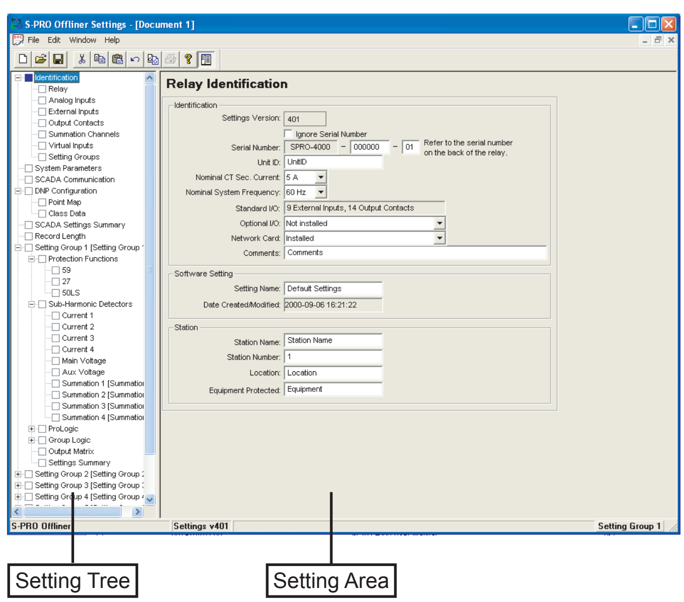


Figure 6.1: Opening Screen

6.2 Offliner Features

Menu and Toolbar

The Offliner software includes the following menu and system tool bar. “Top Tool Bar” on page 6-2 describes the details.

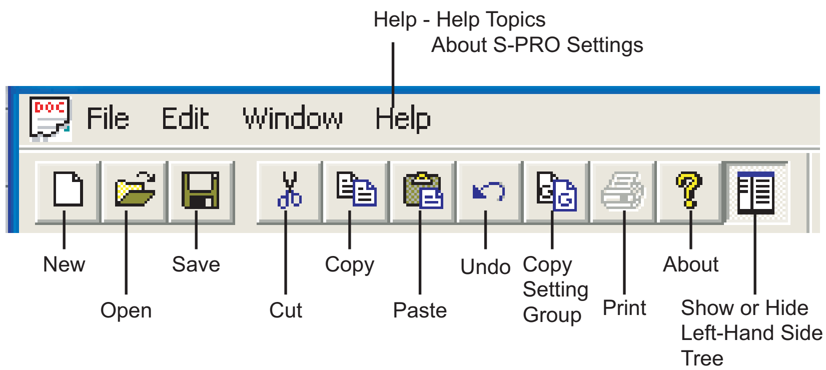


Figure 6.2: Top Tool Bar

Table 6.1: Windows Menu

Windows Menu	**Sub Menu**	**Comment**
Document Menu (Icon)	Restore	Restores active window to previous size
	Move	Allows user to move active window
	Size	Allows user to resize active window
	Minimize	Makes the active window as small as possible
	Maximize	Makes the active window as large as possible
	Close	Closes the active Offliner setting document
	Next	Switches to the next open Offliner setting file, if more than setting file is being edited

Table 6.1: Windows Menu		
File Menu	New	Allows to select the product and the setting version.
	Open	Open an existing setting file
	Close	Closes the active Offliner setting document
	Save	Saves the active setting file
	Save As	Saves the active setting file with a new name or location
	Print	Prints graphs or setting summary depending on active screen
	Print Preview	Provides a print preview of the setting summary
	Print Setup	Changes printers or print options
	1-8	The 8 most recently accessed setting files
	Exit	Quits the program
Edit Menu	Undo	Undo last action
	Cut	Cut the selection
	Copy	Copy the selection
	Paste	Insert clipboard contents
	Copy Setting Group	Brings up the Copy Setting Group dialog to allow copying setting from a Setting Group to one or more Setting Groups.
Window	Cascade	Cascades all open windows
	Tile	Tiles all open windows
	1-9, More Windows	Allows access to all open Offliner setting files. The active document will have a check beside it
Help	User Manual	Displays the user manual
	About Offliner	Displays the Offliner version
Toolbar		
New	Create a new document.	Create a new document of the most recent setting version
Open	Open an existing document.	Open an existing document
Save	Save the active document.	Save the active document
Cut	Cut the selection.	Cut selection
Copy	Copy the selection.	Copy the selection
Paste	Insert clipboard contents.	Insert clipboard contents

Table 6.1: Windows Menu		
Undo	Copy graph to clipboard.	Undo last action
Copy Setting Group		Copy all settings from a group to another setting group.
Print	Print active document.	Prints Graphs or the setting summary, depending on which seen is selected
About	Display program information.	Displays the Offliner version
Show/Hide LHS Tree	Hide/Show Tree	If this option is checked then the LHS Tree view will be hidden

6.3 Offliner Keyboard Shortcuts

The following table lists the keyboard shortcuts that Offliner provides.

Table 6.2: Keyboard Shortcuts	
Ctrl+N	Opens up a default setting file of the most recent setting version
Ctrl+O	Open an existing setting file
Ctrl+S	Saves the active setting file
Ctrl+Z	Undo
Ctrl+X	Cut
Ctrl+C	Copy
Ctrl+V	Paste
Ctrl+F4	Closes the active Offliner setting document
Ctrl+F6	Switches to the next open Offliner setting file, if more than one setting file is being edited
F6	Toggles between the LHS Tree view and HRS screen
F10, Alt	Enables menu keyboard short-cuts
F1	Displays the user manual

6.4 Main Branches from the Tree View

This section will describe the tree view, which provides access to the various setting screens. This section will not describe individual settings, but will provide a general description of where to find the individual settings. For a detailed description of the individual settings see Chapter 4

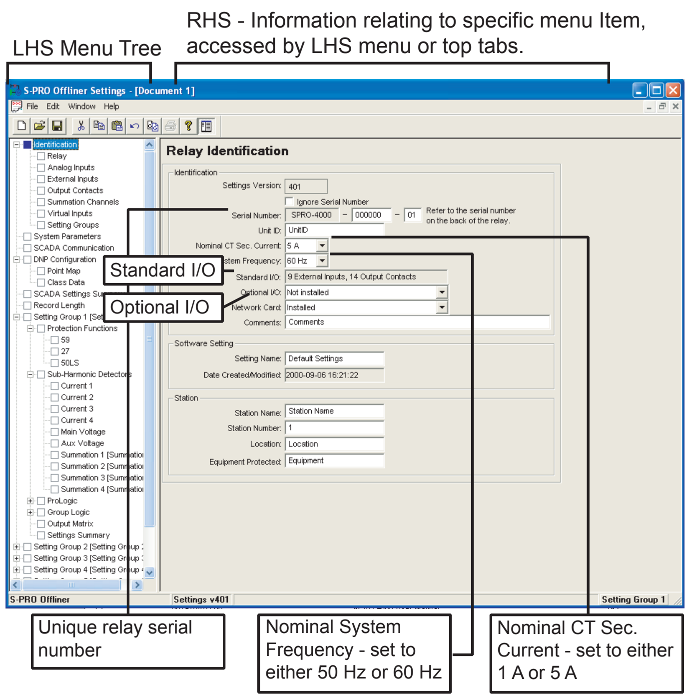


Figure 6.3: Relay Identification

In the LHS Menu Tree there are a series of menu headings that may have sub menus associated with them. Clicking on an item in the left hand side tree view will display its corresponding menu in the RHS view. Similarly, the user can use the arrow keys to scroll through the menu tree.

> The serial number of the relay must match the one in the setting file, or the setting will be rejected by the relay. This feature ensures that the correct setting file is applied to the right relay.
>
> The user can choose to ignore the serial number enforcement in the identification screen. The relay only checks for proper relay type and setting version if the ignore serial number has been chosen.

Identification

The first screen presents all the menu items in the left menu tree. Access the menu items by clicking the tabs at the top of the screen or the item on the left menu tree.

Table 6.3: Identification	
Identification	
Settings Version	Indicates the settings version number, fixed.
Ignore Serial Number	Bypass serial number check, if enabled.
Serial Number	Available at back of each relay.
Relay ID	User-defined up to 20 characters.
Nominal CT Format	5 A or 1 A
Nominal System Frequency	60 Hz or 50 Hz
Comments	User-defined up to 20 characters.
Setting Software	
Setting Name	User-defined up to 20 characters.
Date Created/Modified	Indicates the last time settings were entered.
Station	
Station Name	User-defined up to 20 characters.
Station Number	User-defined up to 20 characters.
Location	User-defined up to 20 characters.
Equipment Protected	User-defined up to 20 characters.

Important Note

Nominal CT Secondary Current can be set to either 1 A or 5 A. Nominal System Frequency can be set to either 50 Hz or 60 Hz. Ensure setting selection matches that of target the relay.

The serial number of the relay must match the one in the setting file, or the setting will be rejected by the relay. This feature ensures that the correct setting file is applied to the right relay.

Choose to ignore the serial number enforcement in the identification screen by checking the *Ignore Serial Number* check box. The relay only checks for proper relay type and setting version if the ignore serial number has been chosen, requires relay firmware version 1.0 or greater.

Analog Inputs

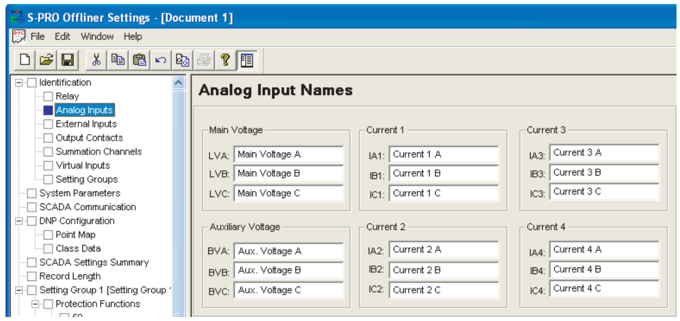


Figure 6.4: Analog Inputs

Analog Input Names screen identifies all the ac voltage and current inputs to the relay. These names appear in any fault disturbance records the relay produces.

Table 6.4: Analog Inputs	
Main Voltage	LVA, LVB, LVC
Main Current	LIA, LIB, LIC
Aux. Voltage	BVA, BVB, BVC
Aux. Current	IA2, IB2, IC2
Current	IA3, IB3, IC3, IA4, IB4, IC4

External Inputs

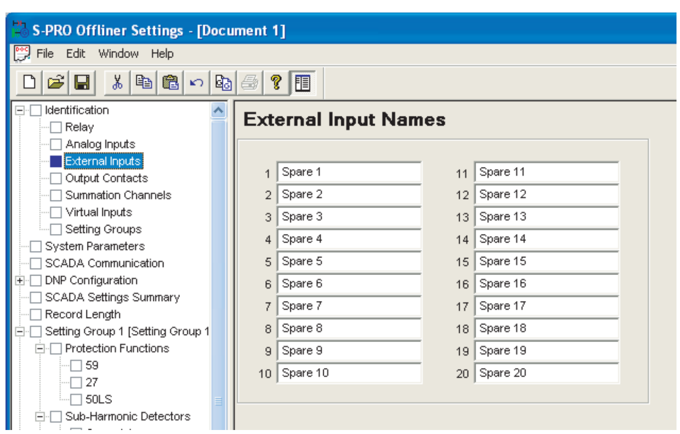


Figure 6.5: External Inputs

External Input Names screen allows the user to define meaningful names for 20 external digital inputs.

Table 6.5: External Input Names	
1 to 20	User-defined

Output Contacts

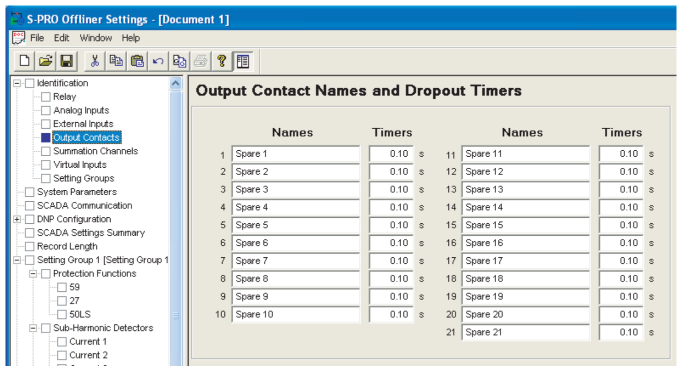


Figure 6.6: Output Contacts

The Output Contacts are also identified during the setting procedure using meaningful names. The dropout delay time settings are made here.

Table 6.6: Output Contact Names	
Outputs 1 to 21	User-defined
Dropout Timer	0.00 to 1.00 s

Summation Channels

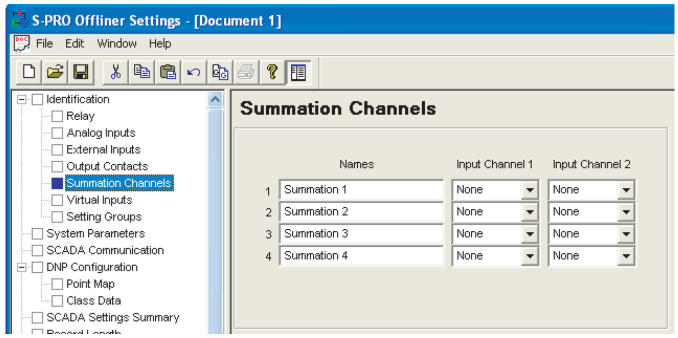


Figure 6.7: Summation Channels

Table 6.7: Summation Channels	
Name	User-defined summation channel name.
Input Channel 1, Input Channel 2	User-selectable current input feeding to summation channel.

Power Channels

Figure 6.8: Power Channels

Two configurable power channels are provided.

Table 6.8: Power Channels	
Name	User-defined power channel name.
Votlage Channel	User-selectable votlage input
Current Channel	User-selectable current input

Virtual Inputs

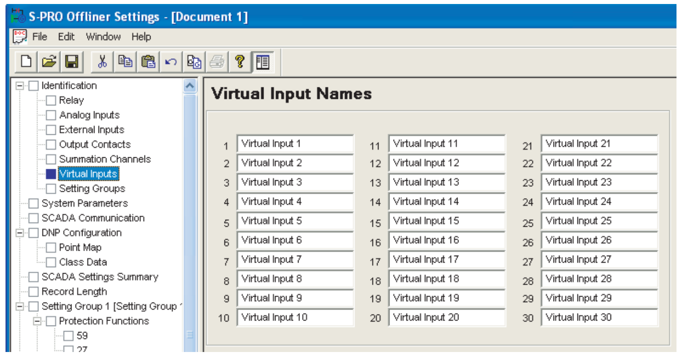


Figure 6.9: Virtual Inputs

Table 6.9: Virtual Inputs	
Virtual Inputs 1 to 30	User-defined

The relay can control its internal functions and connected devices both locally and remotely. Thirty general purpose logic points are accessible via DNP3 and the TUI. The 30 virtual inputs are individually controlled and include a set, reset and pulse function. The latch state is retained during setting changes and relay power down conditions. The 30 virtual inputs conform to DNP3 standards. Use the DNP3 functions such as SBO (select before operate), Direct Operate, or Direct Operate with no acknowledge to control virtual inputs.

Use virtual inputs to:

- control circuit breakers
- enable or disable reclosing
- enable or disable under-frequency load shedding
- change setting groups
- provide interlocking between local/remote supervisory control

Setting Groups

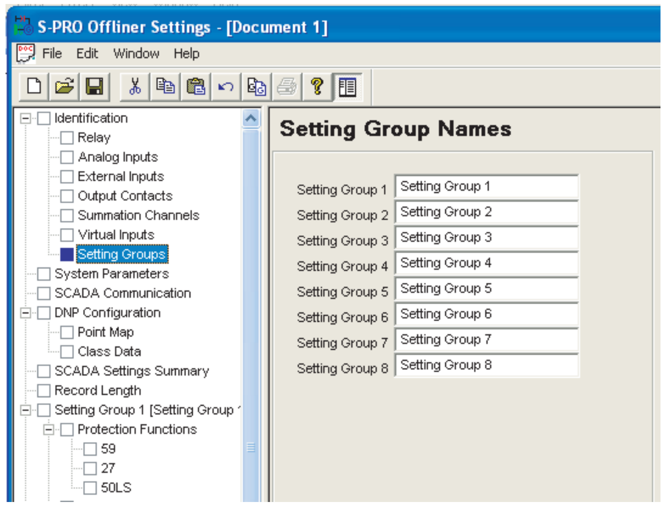


Figure 6.10: Setting Groups

Table 6.10: Setting Groups	
Setting Groups 1 to 8	User-defined

System Parameters

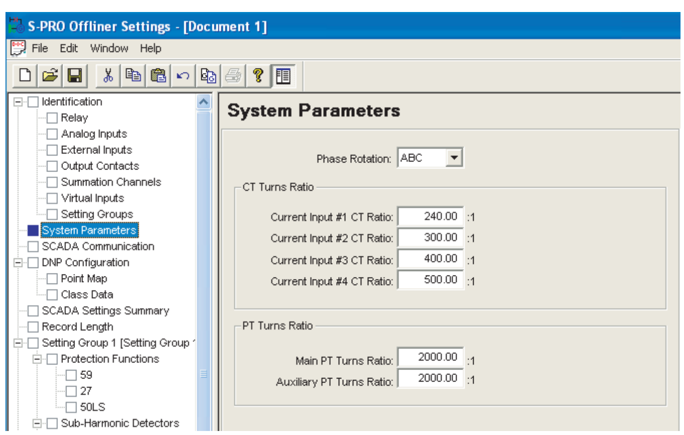


Figure 6.11: System Parameters

SCADA Communication

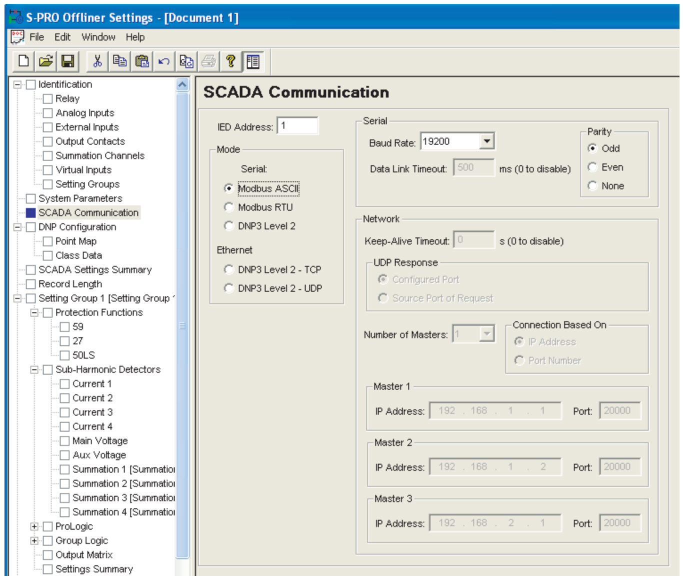


Figure 6.12: SCADA Communication

The relay has configurable SCADA communication parameters for both Serial and Ethernet (TCP and UDP). For DNP3 Level 2 (TCP) up to 3 independent Masters are supported.

DNP Configuration - Point Map

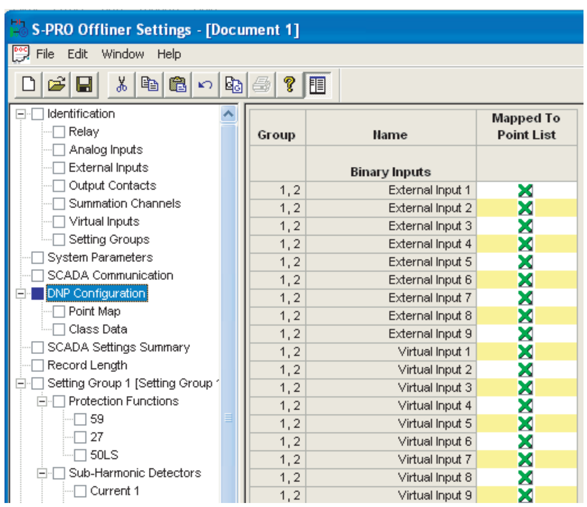


Figure 6.13: Point Map

The relay has configurable DNP point mapping. On the Point Map screen, any of the configurable points may be added or removed from the Point List by clicking (or using the cursor keys and space bar on the keyboard) on the associated check box. A green 'X' denotes that the item will be mapped to the Point List.

The list contains separate sections for Binary Inputs, Binary Outputs, and Analog Inputs. The list is scrollable by using the scroll control on the right hand side.

DNP Configuration - Class Data

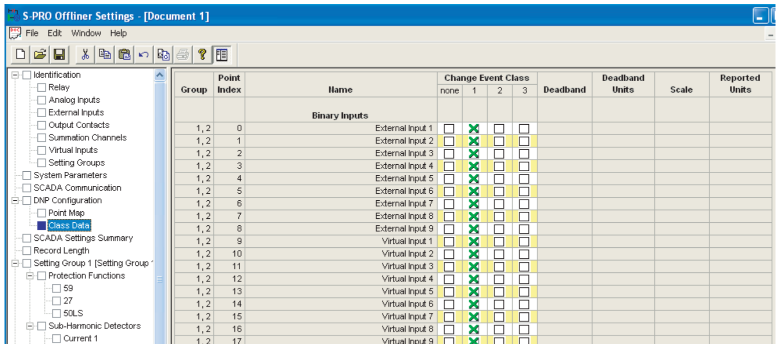


Figure 6.14: Class Data

Class data for each DNP point can be assigned on the Class Data screen. Only Points which were mapped in the Point Map screen will appear here. Sections for Binary Inputs and Analog Inputs appear here; Binary Outputs cannot be assigned a Class. The list is scrollable by using the scroll control on the right hand side.

In addition to assigning a Change Event Class to each mapped point, most Analog Inputs can also be assigned a Deadband and Scaling factor.

SCADA Settings Summary

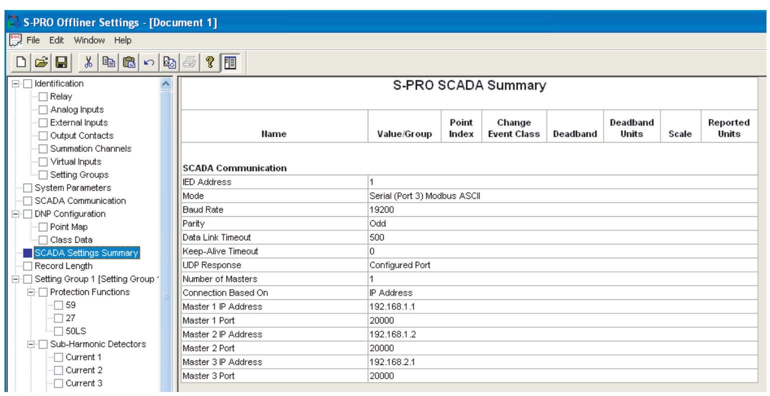


Figure 6.15: SCADA Settings Summary

This screen provides a summary of the current SCADA settings as set in the working setting file. This includes SCADA Communication parameters and (if the SCADA mode is set to DNP) Binary Input, Binary Output, and Analog Input information including Deadband and Scaling factors.

This SCADA Summary screen is scrollable and can be printed.

Record Length

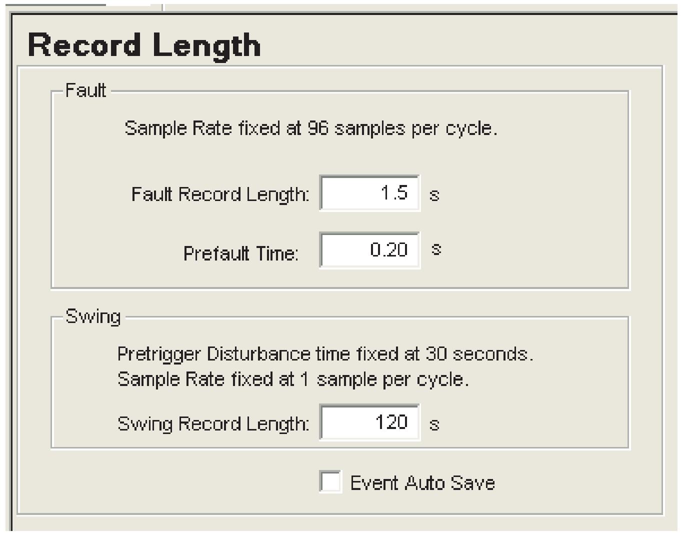


Figure 6.16: Record Length

Table 6.11: Record Length	
Fault	
Fault Record Length	0.2 to 10.0 seconds
Prefault Time	0.1 to 1.5 second
Swing	
Swing Record Length	60 to 120 seconds
Event Auto Save	Enable/Disable

The relay has recording and logging functions to analyze faults and dynamic swing, and to review the operation of the overall protection scheme.

This item identifies the amount of time that each fault record. Prefault is fixed at 0.16 second. There are 2 types of recording provided and the record length times available for each type of recording, transient or swing produce a separate record.

Setting Groups

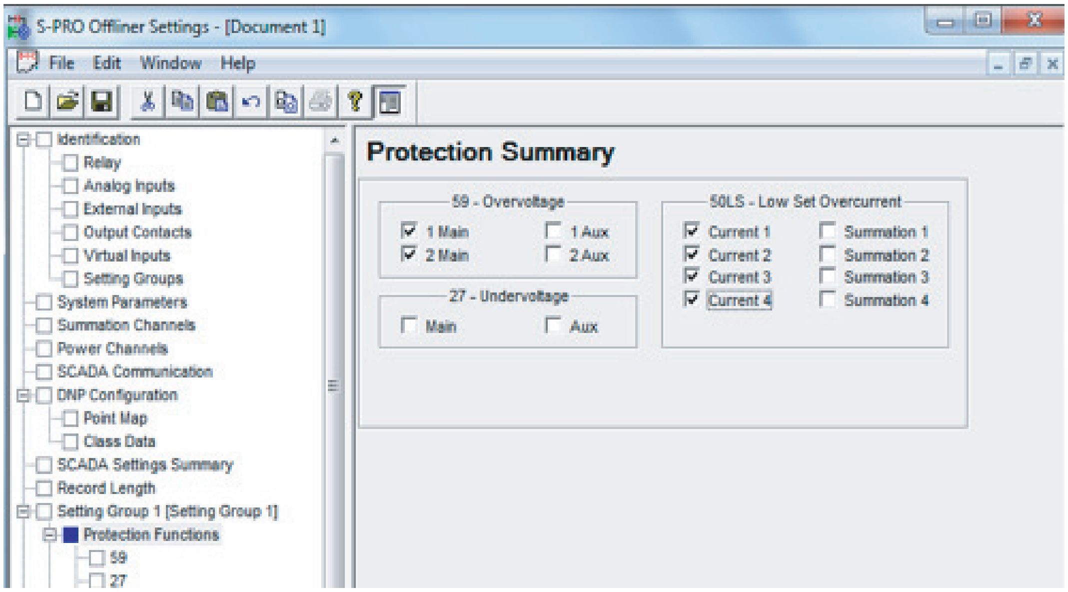


Figure 6.17: Setting Groups Comments

The relay has 8 setting groups (SG). The user can change all relay setting parameters except the physical connections such as input or output parameters in each setting group. Use any one of the 16 available Group Logic Statements per setting group to perform Setting Group changes. The Group Logic statements are similar to the ProLogic statements with the following exceptions, the sole function is to activate one of the 8 setting groups and the processing is in a slower half second cycle. Group Logic inputs statements can be driven from ProLogic or any external input or virtual input or from previous Group Logic statements. Each Group Logic statement includes 5 inputs (with Boolean statements), one latch state and one pickup delay timer. View the active setting group (ASG) from the Terminal Mode, from the front panel or from a record stored by the relay (the active setting group is stored with the record).

Protection Functions

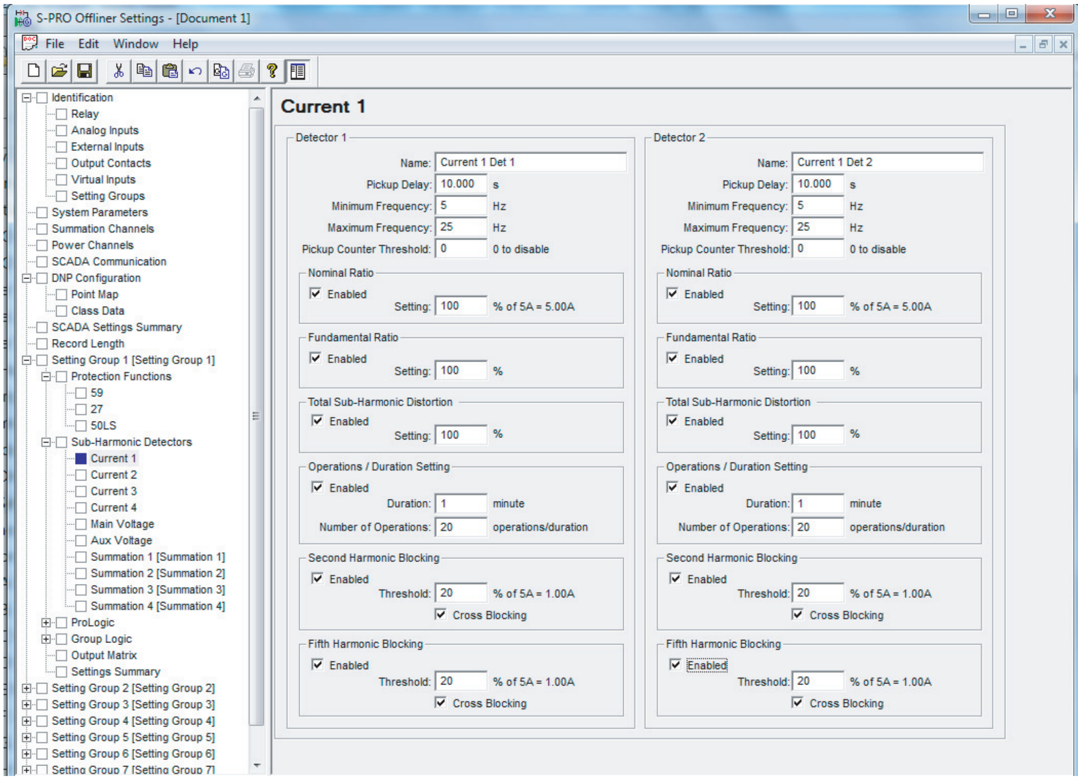


Figure 6.18: Protection Functions

The principle used in detecting the sub-harmonic is known as the Real Time Fourier Transform or Recursive Fourier Transform (RFT). The digital data available after the Analog to Digital Conversion for each voltage and current channel is evaluated based on the following algorithm to track the sub-harmonic frequencies in the range between 5 Hz to 45/55 Hz, with 1 second window. The resolution is 1 Hz. The digital RFT is evaluated in real time for all the input channels (4 sets of 3-phase currents, 2 sets of 3-phase voltages, and 4 sets of 3-phase summated currents). The user can also set a band or group of sub-harmonic frequencies for Nominal or Ratio detectors (Figure 4.2: Sub-Harmonic Measurement and Detection Logic on page 4). The Total subharmonic Detector (TSHD) will be calculated for the 5 Hz – 45/55 Hz range of sub-harmonics with respect to the fundamental. There is a special detector used to track the sub-harmonic occurrence in operations/duration just below the threshold limit, which cannot be tracked by the other two detectors. The functional logic diagram of the proposed sub-harmonic detection relay, for details see Figure 4.2: Sub-Harmonic Measurement and Detection Logic on page 4-4.

Sub-Harmonic Detectors

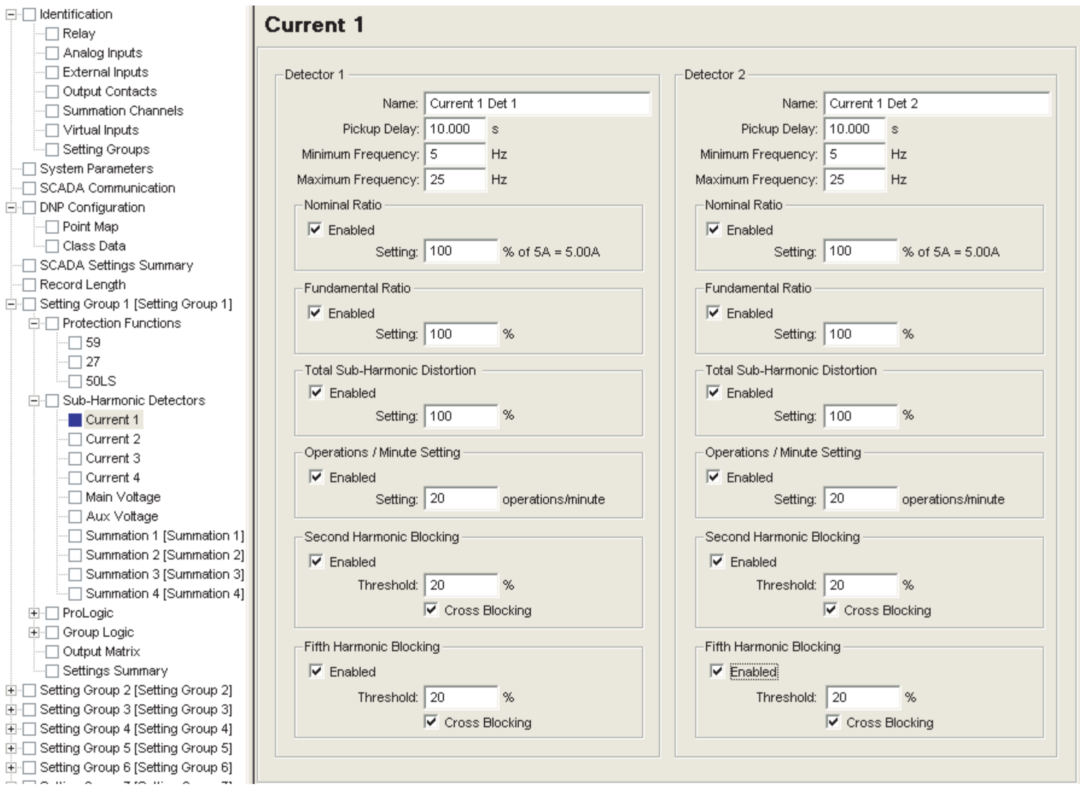


Figure 6.19: Sub-Harmonic Detectors

ProLogic

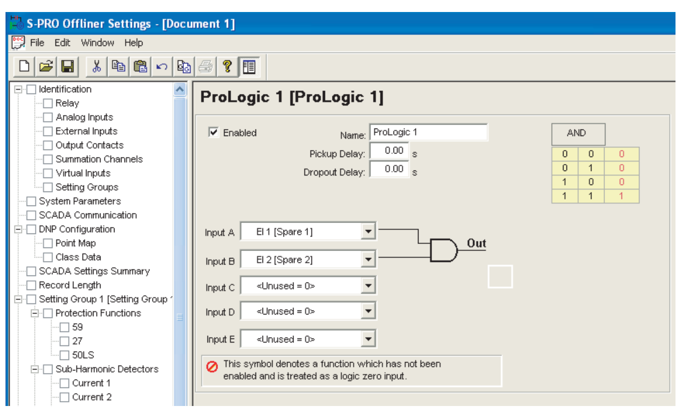


Figure 6.20: ProLogic

Apply ProLogic to multiple inputs to create an output based on qualified inputs. ProLogic enables up to 12 ProLogic control statements and programs those logics to output contacts. The user can name the function being created and set a pickup and dropout delay. Start with input A by selecting any of the relay functions using the list for up to 5 possible inputs. Put these inputs into

AND, NAND, OR, NOR, XOR, NXOR and LATCH logics by clicking on the gate. Invert the input by clicking on the input line.

The output of ProLogic 1 can be nested into ProLogic 2 and so forth. If described, the user can illuminate the front target LED on operation of this function by enabling this feature. The operation of the ProLogic statements are recorded in the events logs.

The above is an example of a ProLogic application where an output is produced if either of the line breakers is slow to open following a line fault.

In this example current through the main and aux line breaker is present as measured by the 50LS Main and the 50LS Aux functions after a protection line trip as by Output Contact 14 and after the 0.50 ms (3 cycles) ProLogic 1 pickup time delay.

Group Logic

The 16 Group Logic statements reside in a slower processing thread within the relay protection algorithms. The processing cycle happens once every half second (0.5 s). When using ProLogic statements the user must keep in mind that a latch or dropout timer should be used if the initiating condition does not last at least 0.5 seconds.

Output Matrix

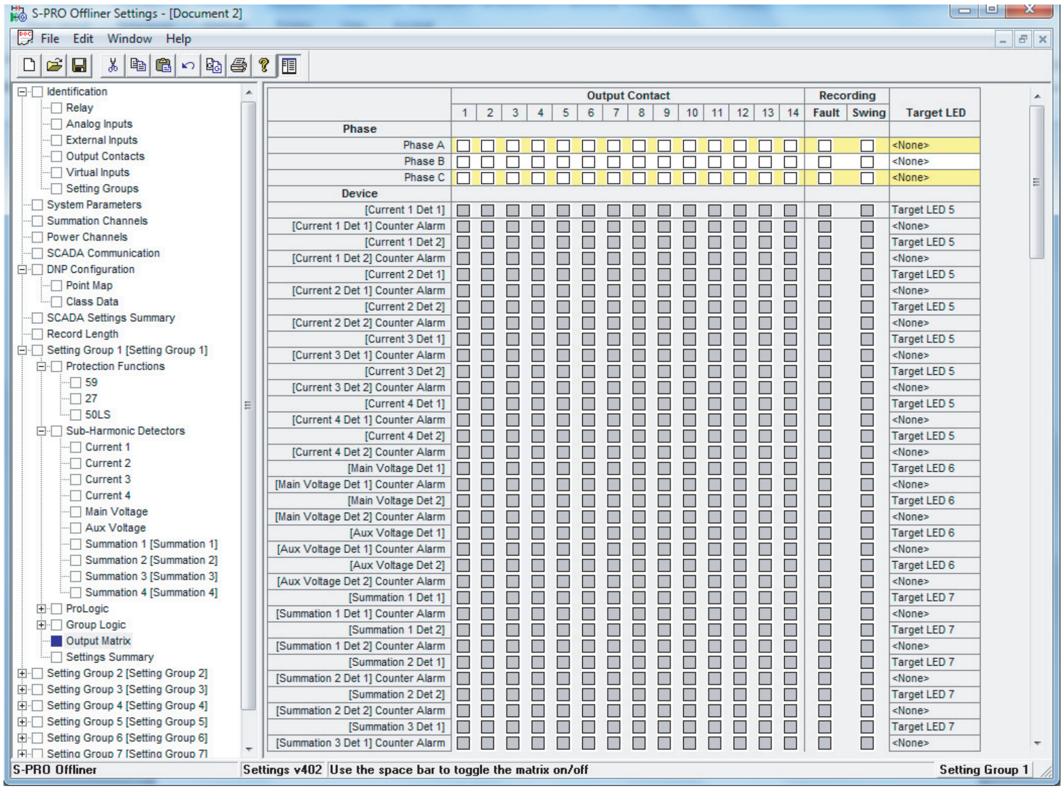


Figure 6.21: Output Matrix

The output contact matrix determines which function initiates which output relay. All output relays have an individual user-selectable stretch time, except those outputs identified as communication initiation outputs. They can have their time delay characteristics changed. Functions also initiate recording as required.

> For a particular function to operate correctly, it must be enabled and must also have its logic output assigned to at least one output contact if it is involved in a tripping function.

Print the entire output matrix by right clicking on the output matrix then selecting the printer icon. This printout is produced on 2 pages.

Settings Summary

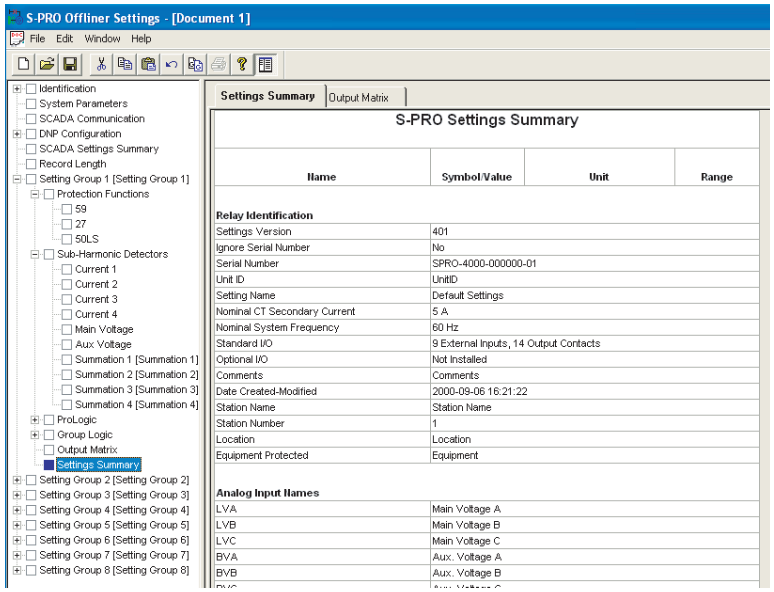


Figure 6.22: Settings Summary

Select *Settings Summary* to view and print the relay settings in text form, for details see “IED Settings and Ranges” in Appendix B..

6.5 Settings From a Record

The settings on the relay at the time of a recording are included in every record and can be viewed through the RecordBase View analysis software. While viewing a recording in RecordBase View, select the *View Setting* button to display the settings. RecordBase View will automatically launch S-PRO Offliner to display the settings in summary form.

If the record contains Setting Groups, the Offliner displays all Setting Groups in the summary. Bold text in the tree view indicates an active Setting Group (the Setting Group used at the time the record was captured). The setting summary is read-only. To edit the setting file associated with the summary, the user must use *File/Save As* to save the summary to a file. Then close the summary screen and open the setting file for editing.

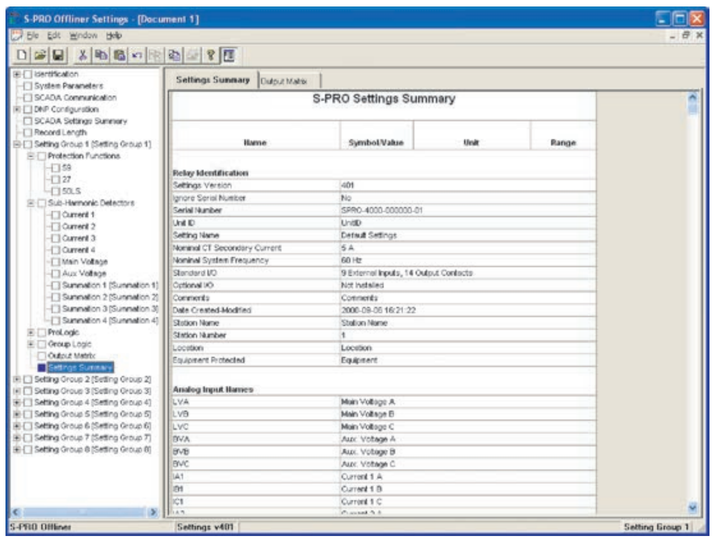


Figure 6.23: View Setting Summary in RecordBase View

7 Acceptance/Protection Function Test Guide

7.1 Introduction

The acceptance test section is a guide for testing any and all protection elements in the relay. These tests should be performed upon first delivery of the relay, prior to applying in-service settings. Once in-service settings are applied, ERLPhase recommends that the user test enabled functions to ensure the designed application is fulfilled.

This section deals with the Acceptance Testing and the S-PRO Acceptance Test Procedure.

First, the acceptance testing describes the test equipment requirements, calibration methods, testing the external inputs and testing the output relay contacts.

7.2 Acceptance Testing

ERLPhase relays are fully tested before leaving the factory. A visual inspection of the relay and its packaging is recommended on receipt to ensure the relay was not damaged during shipping.

> The electronics in the relay contain static sensitive devices and are not user-serviceable. If the front of the relay is opened for any reason exposing the electronics, take extreme care to ensure that the user and the relay are solidly grounded.

Generally an analog metering check, as well as testing the I/O (External Inputs and Output Contacts) is sufficient to ensure the functionality of the relay. Further tests can be performed on delivery and acceptance of the purchaser's option according to the published relay specifications in "IED Settings and Ranges" in Appendix B..

Test Equipment Requirements

- 3 ac voltage sources (variable frequency capability)
- 3 ac current sources
- 1 ohmmeter
- 1 - 125 Vdc test supply

> Set nominal CT secondary current to either 5 A or 1 A, and nominal system frequency to either 60 Hz or 50 Hz. This example uses 5 A/ 60 Hz.

Calibration

The relay is calibrated before it leaves the factory; but if component changes are made within the relay, the user may need to do a re-calibration.

> Before beginning a new calibration, establish the accuracy of the equipment being used.

To perform a calibration, the user must be logged into the relay in using Relay Control Panel at the Service access level to the front USB Port. Proceed to the *Utilities>Analog Input Calibration* tab. The Calibrate menu leads the user through every analog input and prompts the user to apply the appropriate quantity.

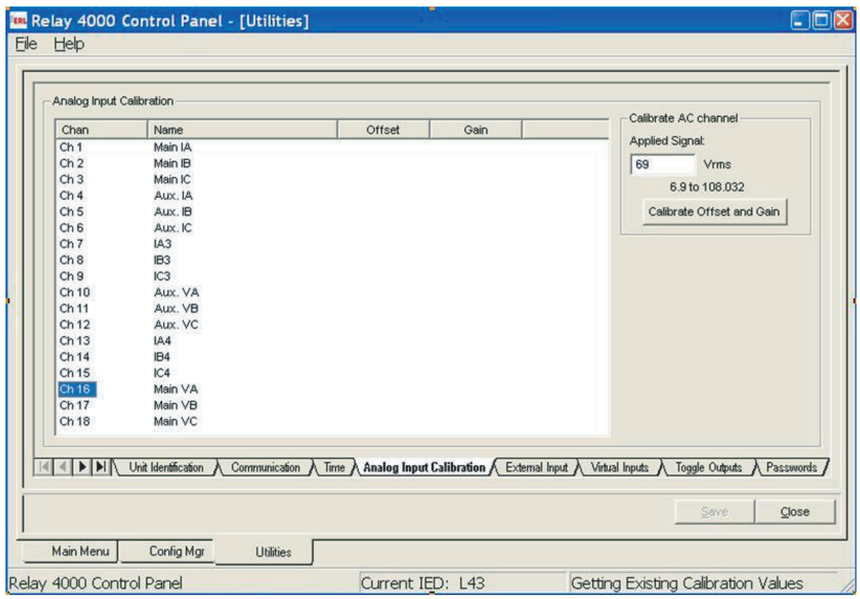


Figure 7.1: Enter actual applied signal level

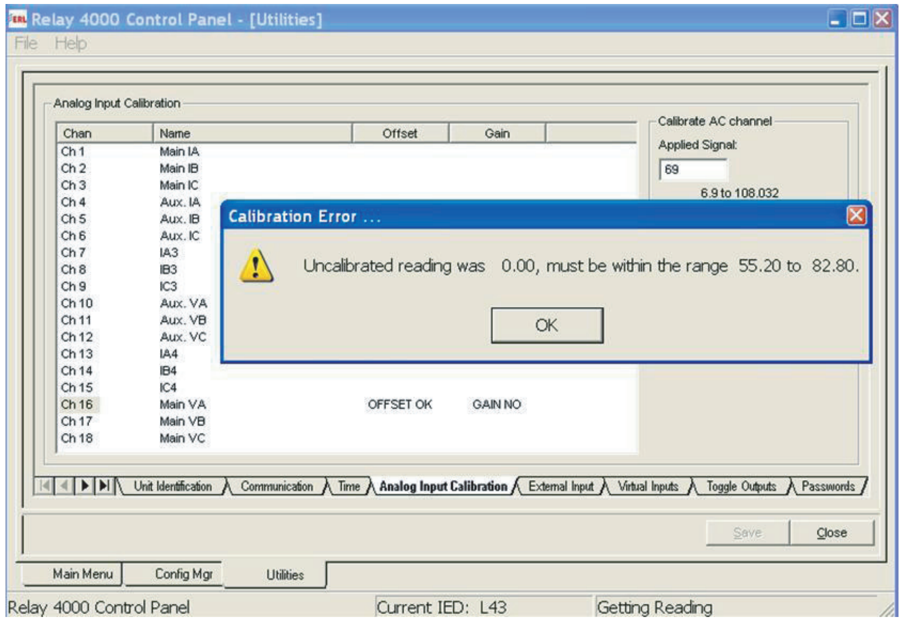


Figure 7.2: Calibration error - out of range

For example, when selecting voltage VA for calibration, a prompt appears which asks which quantity the relay should try to calibrate. If a 66 V phase-to-neutral quantity is applied to the back VA terminals, 66.0 V would be indicated as the desired calibration.

In a similar way, the user is prompted to go through all 18 ac analog quantities and provide the information about the injected calibration quantities. The user must have a test source to perform this function. Only the magnitude of the analog input requires calibration, not the angle.

When an analog input channel is calibrated, verify the quantity measured by selecting the Metering menu and the Analog Quantity submenu. VA of the ac voltage input is used as a reference quantity by the relay. Therefore, if it is absent, there is not a locked, valid relationship among all of the analog quantities.

Testing the External Inputs

To test the external inputs connect the relay using Relay Control Panel, *Metering>External.* This screen displays the status of the Input and Output Contacts. Placing a voltage of 125 $\text{Vdc}_{nominal}$, (150 $\text{V}_{maximum}$), to each of the external inputs in turn causes the input to change from Low to High status. These inputs are polarity sensitive and this screen has a 0.5 second update rate.

Testing the Output Relay Contacts

Test the output relays to verify their integrity using the *Utilities>Toggle Outputs* tab in Relay Control Panel. Activate the option Relay in Test Mode. Toggle the output contacts using the Open and Closed commands after selecting the desired output. Verify the output contact status using an ohmmeter. When exiting this sub-menu, each contact status reverts to the open position.

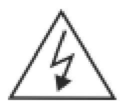
8 Installation and Safety Instructions

8.1 Introduction

This section deals with the installation of the S-PRO relay when first delivered. The section covers the physical mounting, AC and DC wiring and the Communication wiring.

The following symbols are used in this manual and on the unit. They should be understood before working on the unit:


Caution: refer to equipment documentation


Caution: risk of electric shock


Protective Earth (or Ground) Terminal


Autoranging power supply


Both direct and alternating current

The equipment ratings, operating instructions and installation instructions shall be checked before commissioning or maintenance. It is the responsibility of the user to ensure that the equipment is installed, operated and used for its intended function in the manner specified in this manual. If this is not the case then any safety protection provided by the equipment may be impaired.

8.2 Physical Mounting

Standard 3U

The relay is 3 rack units or 5.25 inches high and approximately 12.9 inches deep. The standard relay is designed for a 19-inch rack. A complete mechanical drawing is shown, for details see “Mechanical Drawings” in Appendix G.

To install the relay the following is needed:

- 19 inch rack
- 4 - #10 or M6 screws

WARNING!

This equipment is intended for use by trained personnel in restricted areas only. Hazardous voltages may be present at the rear of the unit and a suitable protective barrier must be provided to protect against electric shock due to accidental contact.

8.3 Case Grounding

WARNING!

The ground terminal (also known as the protective earth) on the rear of the unit must be connected as shown in Figure 8.1: Protective Earth Connection on page 3 before the unit is energized in order to prevent electric shock. Refer to the diagram of the rear of the unit, Figure 1.2: S-PRO Relay Rear View on page 2 for the location of the ground terminal. The protective earth connections shall be checked before carrying out any other actions.

The terminal used must be made of a material that is galvanically compatible with the zinc plated washers, nut and stud provided with the unit. Tinned terminals are acceptable. The recommended minimum protective earth conductor wire size is 3.3 mm² unless otherwise required by local or country wiring regulations. Copper wire is recommended and must be must be low-inductance and as short as possible.

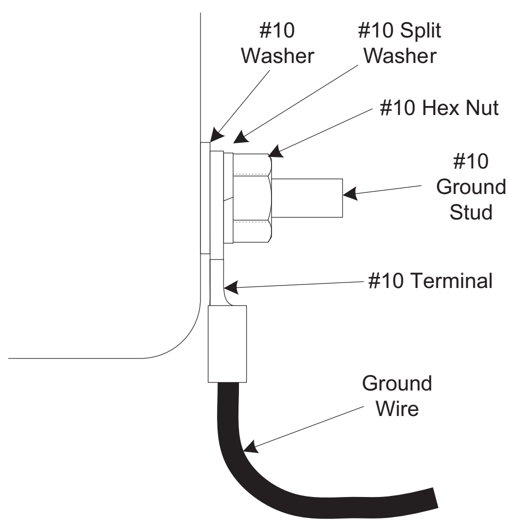


Figure 8.1: Protective Earth Connection

8.4 Power Supply

A wide range power supply is standard. When the External Inputs are configured for 220 V/250 V operation then the nominal operating range is 43 – 275 Vdc, 90 – 265 Vac, 50/60 Hz. When the External Inputs are configured for 48 V or 110 V/125 V operation then the nominal operating range is 43 – 150 Vdc, 90 – 150 Vac, 50/60 Hz. To protect against a possible short circuit in the supply use an inline fuse or circuit breaker. The fuse should be: slow-blow 5 A, 250 Vac, inline fuse (T 5 A 250 V). The circuit breaker should be: 5 A, 250 Vac, single-pole. The fuse or circuit breaker should be installed on the AC LINE or DC POSITIVE connection. Ensure that the chassis is grounded for proper operation and safety. The wire used for the power supply wiring shall be at least 18 AWG (1.02 mm^2), 600 V.

There are no power switches on the relay. When the power supply is connected, the relay starts its initialization process. See “Using the IED (Getting Started)” on page 3-1 for the start up process details.

The use of an external surge protection device is required to pass the surge immunity requirements of IEC/EN 60255-22-5 Criterion A. Suitable surge arrestors are to be selected and installed to limit to 1.1KV (L-N) and 1.5KV (L-PE) levels with suitable energy handling capacity. Contact ERLPhase technical support for assistance in selecting an appropriate device if needed.

One surge protector can be used to protect multiple units as long as the current limit of the surge protection device is not exceeded.

Note that this is a consumable item and not covered by ERLPhase warranty.

8.5 AC and DC Wiring

For details see “AC Schematic Drawings” in Appendix I and “DC Schematic Drawings” in Appendix J

#6 ring or spade terminals must be used to connect all wires to the screw terminals on the rear of the unit. Bare wires should never be terminated directly to the screw terminals.

The following minimum cross section and voltage ratings are required for the wires:

- External Inputs: 28 AWG (0.33 mm^2), 600 V
- Output Contacts: 16 AWG (1.29 mm^2), 600 V
- 5 A current Inputs: 10 AWG (2.59 mm^2), 1000 V
- 1 A current inputs: 14 AWG (1.63 mm^2), 600 V
- Voltage inputs: 14 AWG (1.63 mm^2), 600 V

Ensure the power supply input and the AC and DC wires are de-energized before working on the wiring. Failure to do so could result in electric shock.

CT circuits shall be short-circuited before working on the current input wires.

8.6 Communication Wiring

EIA-232

The relay’s serial ports (Ports 122 and 123) are configured as EIA RS-232 Data Communications Equipment (DCE) devices with female DB9 connectors. This allows them to be connected directly to a PC serial port with a standard straight-through male-to-female serial cable. Shielded cable is recommended, for pin-out see “Communication Port Details” on page 2-15.

An adapter is available for connecting an external modem to Port 123 for details see “Modem Link” on page 2-7.

Ethernet

Port 119 on the front of the unit is an RJ-45 receptacle. Port 119 and 120 on the rear of the unit may be configured as RJ-45 receptacles. These are 100BASE-TX Ethernet ports. Use CAT5 or CAT5e straight cable with standard RJ-45 plugs for these ports.

Port 119 and 120 on the rear of the unit may also be configured as ST style optical connectors. These are 1300 nm 100BASE-FX Ethernet ports. The transmit and receive connections are indicated on the rear panel. Use standard multimode fiber with ST connectors for these ports.

> This is a class I laser product and is considered safe however viewing fiber-optic output ports directly is not recommended.

USB

There is a standard USB-B connector on the front panel. This is a USB 2.0 Full Speed interface and can be connected to a PC with a standard USB peripheral cable (A style to B style). Shielded cable is recommended.

RJ-11

The relay may have an optional internal modem. Connection to this is via the relay’s Port 118 RJ-11 receptacle. A standard telephone extension cable is to be used. Shielded cable is recommended.

IRIG-B Wiring

The relay accepts both modulated and unmodulated IRIG-B standard time signals with or without the IEEE 1344 extensions. The IRIG-B connector on the back of the relay is BNC type. Shielded cable is recommended.

Appendix A IED Specifications

S-PRO Model 4001 Specifications		
Item	**Quantity/Specs**	**Note**
General:		
Overvoltage Category	Overvoltage Category III	
Pollution Degree	Pollution Degree 2	
Insulation Class	Class I	
Ingress Protection	IP30 standard	Contact factory for IP50 on front panel
Nominal Frequency	50 or 60 Hz	
Operate Time for Normal Protection Functions (50LS, 27, 59)	Less than 1.5 cycles	Including output relay operation
Power Supply	Nominal supported: 48 – 250 Vdc, 100 – 240 Vac Nominal for CE compliance: 48 – 125 Vdc, 100 – 120 Vac	Voltage tolerance: ±10% Maximum current: 0.7 A
Memory	Settings and records are stored in non-volatile memory	Records are stored in a circular buffer
Protection Functions:		
IEEE Dev. 59, 27, 50LS Sub-harmonic detectors (2 voltages, 4 currents and 4 current summa-tions)	2 x3 phase voltage inputs 4 x3 phase current inputs 4 x3 phase summation current inputs derived from current inputs	Suitable for ring bus configuration
ProLogic	24 statements per setting group	5 inputs per ProLogic™ statement
Group Logic	8 (16 group logic statements per setting group)	5 inputs per group logic statement
Recording:		
Transient (Fault)	96 s/c oscillography of all analog and external input channels	User-configurable 0.2 to 10.0 seconds Record length and 0.1 to 2 seconds prefault length
Dynamic Swing	1 s/c phasor measurements of line positive sequence V and I plus frequency	User-configurable 60 – 120 seconds. Pre trigger time fixed at 30secs
Events	250 events circular log with 1ms resolution	When event auto save is enabled, a compressed event record is created every 250 events.
Record Capacity	75 records of a combination of transient, swing and optionally event records	

S-PRO Model 4001 Specifications

Input & Output:		
Analog Voltage Inputs 2 sets of 3-phase voltage inputs (6 voltage channels total)	Nominal Voltage - across input channel Full Scale/Continuous Maximum Over-scale Thermal Rating Burden	Vn = 69 Vrms (120 Vrms L-L) 2x Vn = 138 Vrms (240 Vrms L-L) 4x Vn = 276 Vrms (480 Vrms L-L) for 3 seconds 3x Vn = 207 Vrms (360 Vrms L-L) for 10 seconds <0.03VA @ Vn
Analog Current Inputs 4 sets of 3-phase current inputs (12 current channels)	Nominal Current Full Scale/Continuous Maximum full-scale rating Thermal rating Burden	In = 1 Arms or 5 Arms 4x In = 4 Arms or 20 Arms 40x In for 1 second symmetrical 50x In for 3 seconds 100x In for 1 second <0.25 VA @ 5 Arms, <0.10VA @ 1 Arms
Amplitude measurement accuracy	+/-0.5% for 54 to 66 Hz (60 Hz nominal) +/-0.5% for 44 to 56 Hz (50 Hz nominal)	
Analog Sampling Rate	96 samples/cycle for recording 8 samples/cycle for protection	Records up to 25th harmonic
External Inputs	9 isolated inputs (3U chassis)	Optional 48, 110/125 or 220/250 Vdc nominal, externally wetted. All inputs can be on continuously. The 220/250 Vdc option is not available if CE compliance is required.
Isolation	2 KV optical isolation	
External Input Turn-on Voltage	48 Vdc range = 27 to 40 Vdc 125 Vdc = 75 to 100 Vdc 250 Vdc = 150 to 200 Vdc, 60% to 80% of nominal	Externally wetted
Output Relays (contacts)		Externally wetted
Normal Contacts	3U: 14 programmable normal outputs and 1 relay inoperative normal output (normally closed)	Make: 30 A as per IEEE C37.90 Carry (all outputs active): 4 A continuous 6 A for 22 minutes 8 A for 13 minutes Break: 0.9 A at 125 Vdc resistive 0.35 A at 250 Vdc resistive
Virtual Inputs	30 Virtual Inputs	
Interface & Communication:		
Front Display	240 x128 pixels graphics LCD	
Front Panel Indicators	16 LEDs: 11 programmable, 5 fixed	Fixed: Relay Functional, IRIG-B Functional, Service Required, Test Mode, Alarm Target (11 programmable)
Front User Interface	USB port and 100BASE-T Ethernet port	Full Speed USB 2.0, RJ-45

S-PRO Model 4001 Specifications		
Rear User Interface	LAN Port 1: 100BASE Copper or Optical 1300nm LAN Port 2: 100BASE Copper or Optical Two Serial RS-232 ports to 115 kbd modem	Copper: RJ-45, 100BASE-T Optical: 100BASE-FX, Multimode ST style connector Com port can support external modem
Internal Modem	33.6 Kbps, V.32 bis	Optional internal modem
SCADA Interface	IEC61850 (Ethernet) or DNP3 (RS-232 or Ethernet) or Modbus (RS-232)	Rear port
Time Sync	IRIG-B, BNC connector B003,B004,B123 and B124 Time Codes	Modulated or unmodulated, auto-detect
Self Checking/Relay Inoperative	1 contact	Closed when relay inoperative
Environmental:		
Ambient Temperature Range	-40°C to 85°C for 16 hours -40°C to 60°C continuous	IEC 60068-2-1/IEC 60068-2-2 LCD contrast impaired for temperatures below -20°C and above 60° C
Humidity	Up to 95% without condensation	IEC 60068-2-30
Insulation Test (Hi-Pot)	Power supply, analog inputs, external inputs, output contacts – 2 kVrms, 50/60 Hz, 1 minute	IEC 60255-5, ANSI/IEEE C37.90
Electrical Fast Transient	Tested to level 4 - 4.0 kV 2.5/5 kHz on Power and I/O lines	ANSI/IEEE C37.90.1, IEC/EN 60255-22-4, IEC 61000-4-4
Oscillatory Transient	Test level = 2.5kV	ANSI/IEEE C37.90.1, IEC/EN 60255-22-1, IEC61000-4-12 Level 3
RFI Susceptibility	10 V/m modulated, 35 V/m unmodulated	ANSI/IEEE C37.90.2, IEC 60255-22-3, IEC 61000-4-3 Level 3
Conducted RF Immunity	150 kHz to 80 MHz	IEC 60255-22-6 / IEC 61000-4-6 Level 3
Shock and Bump	5 g and 15 g	IEC 60255-21-2, IEC/EN 60068-2-27: Class 1
Sinusoidal Vibration	1 g, 10 Hz to 150 Hz, 1.0 octave/min, 40 sweeps	IEC/EN 60255-21-1, IEC/EN 60068-26, Class 1
Voltage Interruptions	200 ms interrupt	IEC 60255-11 / IEC 61000-4-11
Physical:		
Weight	3U chassis - 10.3 kg/22.6 lbs	
Dimensions	3U chassis: 13.2 cm height x 48.26 cm width rack mount x 32.8 cm depth	5.2 height x 19 width rack mount x 12.9 depth
Time Synchronization and Accuracy		
External Time Source	Synchronized using IRIG-B input (modulated or unmodulated) auto detect	Upon the loss of an external time source, the relay maintains time with a maximum 160 seconds drift per year at a constant temperature of 25C. The relay can detect loss or re-establishment of external time source and automatically switch between internal and external time.

S-PRO Model 4001 Specifications		
Synchronization Accuracy	Sampling clocks synchronized with the time source (internal or external)	

S-PRO Model 4001 Specifications

Overall S-PRO Accuracies	
Current (Fundamental)	±2.5% of inputs from 0.1 to 1.0 x nominal current (I_n)
	± 1.0% of inputs from 1.0 to 40.0 x nominal current (I_n)
Voltage (Fundamental)	± 1.0% of inputs from 0.01 to 2.0 x nominal voltage (V_n)
Timers	±3 ms of set value
Frequency	0.2 Hz

Detailed Environmental Tests

Test	Description		Test Level
	Test Type	Test Points	
FCC Part 15	RF emissions	Enclosure ports	Class A: 30 – 1000 MHz
	Conducted emissions	ac/dc power ports	Class A: 0.15 – 30 MHz
IEC/EN 60255-25	RF emissions	Enclosure ports	Class A: 30 – 1000 MHz
	Conducted emissions	ac/dc power ports	Class A: 0.15 – 30 MHz
IEC/EN 61000-3-2	Power line harmonics	ac power port	Class D: max.1.08, 2.3, 0.43, 1.14, 0.3, 0.77, 0.23 A...for 2nd to nth harmonic
		dc power port	N/A
IEC/EN 61000-3-3	Power line fluctuations	ac power port	THD/3%; Pst < 1, Plt < 0.65
		dc power port	N/A
IEC/EN 61000-4-2 IEC/EN 60255-22-2	ESD	Enclosure contact	+/- 6 kV
		Enclosure air	+/- 8 kV
IEEE C37.90.3	ESD	Enclosure contact	+/- 8 kV
		Enclosure air	+/- 15 kV
IEC/EN 61000-4-3 IEC/EN 60255-22-3	Radiated RFI	Enclosure ports	10 V/m: 80 – 1000 MHz
IEEE C37.90.2	Radiated RFI	Enclosure ports	35 V/m: 25 – 1000 MHz
IEC/EN 61000-4-4 IEC/EN 60255-22-4 IEEE C37.90.1	Burst (Fast Transient)	Signal ports	+/- 4 kV @ 2.5 kHz
		ac power port	+/- 4 kV
		dc power port	+/- 4 kV
		Earth ground ports	+/- 4 kV

Detailed Environmental Tests			
Test	**Description**		**Test Level**
	Test Type	**Test Points**	
IEC/EN 61000-4-5 IEC/EN 60255-22-5	Surge	Communication ports	+/- 1 kV L-PE
		Signal ports	+/- 4 kV L-PE, +/-2 kV L-L
		ac power port	+/- 4 kV L-PE, +/-2 kV L-L
		dc power port	+/- 2 kV L-PE, +/-1 kV L-L
IEC/EN 61000-4-6 IEC/EN 60255-22-6	Induced (conducted) RFI	Signal ports	10 Vrms: 0.150 – 80 MHz
		ac power port	10 Vrms: 0.150 – 80 MHz
		dc power port	10 Vrms: 0.150 – 80 MHz
		Earth ground ports	10 Vrms: 0.150 – 80 MHz
IEC/EN 60255-22-7	Power frequency	Binary input ports: Class A	Differential = 150 Vrms
			Common = 300 Vrms
IEC/EN 61000-4-8	Magnetic field	Enclosure ports	40 A/m continuous, 1000 A/m for 1 s
IEC/EN 61000-4-11 IEC/EN 61000-4-29	Voltage dips & interrupts	ac power port (120 Vac)	Up to 70% for 10/12 cycles (50/60 Hz)
			100% for 5/6 cycles (50/60 Hz)
		dc power port (48 Vdc)	30% for 1 s, 60% for 30 ms, 100% for 30 ms
IEC 60255-11	Voltage dips & Iiterrupts	dc power port	100% reduction for up to 200 ms
IEC/EN 61000-4-12 IEC/EN 60255-22-1	Damped oscillatory	Communication ports	1.0 kV common, 0 kV diff
		Signal ports	2.5 kV common, 1 kV diff
		ac power port	2.5 kV common, 1 kV diff
		dc power port	2.5 kV common, 1 kV diff
IEEE C37.90.1	Oscillatory	Signal ports	2.5 kV common, 0 kV diff
		ac power port	2.5 kV common, 1 kV diff
		dc power port	2.5 kV common, 1 kV diff
IEC/EN 61000-4-16	Mains frequency voltage	Signal ports	30 V continuous, 300 V for 1 s
		dc power port	30 V continuous, 300 V for 1 s
IEC/EN 61000-4-17	Ripple on dc power supply	dc power port	10%

A.1 External Input Pickup Filter

To guarantee security from spurious voltage pulses an external input pickup filter setting has been introduced. This setting is made in terminal mode under, *Utilities>Setup>External Inputs*. The setting is an integer number representing the number of samples in a packet of 12 that must be recognized by the DSP as high before an External Input status is changed from low to high. This will affect the pulse width required for the External Inputs to be detected. Below is a table describing the pulse widths for possible and definite defection for each setting.

Pickup Filter Count	Input Pulse Width required for EI to be possibly detected	Input Pulse Width required for EI to be definitely detected
4	0.694 ms	1.215 ms
5	0.868 ms	1.563 ms
6	1.042 ms	1.909 ms
7	1.215 ms	2.257 ms
8	1.389 ms	2.604 ms
9	1.563 ms	2.951 ms
10	1.736 ms	3.299 ms
11	1.909 ms	3.645 ms
12	2.083 ms	3.993 ms

For a setting of 6, it will take between 1.042 and 1.909 ms for an External Input to be declared as high. The default setting is 4.

Appendix B. IED Settings and Ranges

B.1 Settings and Ranges

The Offliner software provides a means for the user to view and print a compact summary of the settings defined in each Setting Group, for a given device. The user can view the summary by selecting the Settings Summary option (last item) under each Setting Group listed in the Offliner application.

The summary includes general data from the Relay Identification screen, as well as all the user-defined names of inputs (e.g. current, voltage, virtual) and control outputs, and Group Logic definitions. It also includes all the user-defined settings along with their respective units and permissible value range.

The following pages illustrate the Settings Summary for Settings Group 1.

S-PRO Settings Summary			
Name	**Symbol/Value**	**Unit**	**Range**
Relay Identification			
Settings Version	401		
Ignore Serial Number	No		
Serial Number	SPRO-4001-000000-01		
Unit ID	UnitID		
Setting Name	Default Settings		
Nominal CT Secondary Current	5 A		
Nominal System Frequency	60 Hz		
Standard I/O	9 External Inputs, 14 Output Contacts		
Optional I/O	Not Installed		
Comments	Comments		
Date Created-Modified	2015-01-01 16:21:22		
Station Name	Station Name		
Station Number	1		
Location	Location		
Equipment Protected	Equipment		
Analog Input Names			
LVA	Main Voltage A		
LVB	Main Voltage B		
LVC	Main Voltage C		

BVA	Aux. Voltage A		
BVB	Aux. Voltage B		
BVC	Aux. Voltage C		
IA1	Current 1 A		
IB1	Current 1 B		
IC1	Current 1 C		
IA2	Current 2 A		
IB2	Current 2 B		
IC2	Current 2 C		
IA3	Current 3 A		
IB3	Current 3 B		
IC3	Current 3 C		
IA4	Current 4 A		
IB4	Current 4 B		
IC4	Current 4 C		
External Input Names			
1	Spare 1		
2	Spare 2		
3	Spare 3		
4	Spare 4		
5	Spare 5		
6	Spare 6		
7	Spare 7		
8	Spare 8		
9	Spare 9		
Output Contact Names			
Output 1	Spare 1		
Output 2	Spare 2		
Output 3	Spare 3		
Output 4	Spare 4		
Output 5	Spare 5		
Output 6	Spare 6		
Output 7	Spare 7		
Output 8	Spare 8		
Output 9	Spare 9		
Output 10	Spare 10		

Output 11	Spare 11		
Output 12	Spare 12		
Output 13	Spare 13		
Output 14	Spare 14		
Summation Channels			
1	Summation 1		
Input Channel 1	None		
Input Channel 2	None		
2	Summation 2		
Input Channel 1	None		
Input Channel 2	None		
3	Summation 3		
Input Channel 1	None		
Input Channel 2	None		
4	Summation 4		
Input Channel 1	None		
Input Channel 2	None		
Power Channels	None		
Voltage channel 1	None		
Current channel 1	None		
Voltage channel 2	None		
Current channel 2	None		
Output Contact Dropout Timers			
Output1 (Spare 1)	0.10	s	0.00 to 1.00
Output2 (Spare 2)	0.10	s	0.00 to 1.00
Output3 (Spare 3)	0.10	s	0.00 to 1.00
Output4 (Spare 4)	0.10	s	0.00 to 1.00
Output5 (Spare 5)	0.10	s	0.00 to 1.00
Output6 (Spare 6)	0.10	s	0.00 to 1.00
Output7 (Spare 7)	0.10	s	0.00 to 1.00
Output8 (Spare 8)	0.10	s	0.00 to 1.00
Output9 (Spare 9)	0.10	s	0.00 to 1.00
Output10 (Spare 10)	0.10	s	0.00 to 1.00
Output11 (Spare 11)	0.10	s	0.00 to 1.00
Output12 (Spare 12)	0.10	s	0.00 to 1.00
Output13 (Spare 13)	0.10	s	0.00 to 1.00

Output14 (Spare 14)	0.10	s	0.00 to 1.00
Virtual Input Names			
VI 1	Virtual Input 1		
VI 2	Virtual Input 2		
VI 3	Virtual Input 3		
VI 4	Virtual Input 4		
VI 5	Virtual Input 5		
VI 6	Virtual Input 6		
VI 7	Virtual Input 7		
VI 8	Virtual Input 8		
VI 9	Virtual Input 9		
VI 10	Virtual Input 10		
VI 11	Virtual Input 11		
VI 12	Virtual Input 12		
VI 13	Virtual Input 13		
VI 14	Virtual Input 14		
VI 15	Virtual Input 15		
VI 16	Virtual Input 16		
VI 17	Virtual Input 17		
VI 18	Virtual Input 18		
VI 19	Virtual Input 19		
VI 20	Virtual Input 20		
VI 21	Virtual Input 21		
VI 22	Virtual Input 22		
VI 23	Virtual Input 23		
VI 24	Virtual Input 24		
VI 25	Virtual Input 25		
VI 26	Virtual Input 26		
VI 27	Virtual Input 27		
VI 28	Virtual Input 28		
VI 29	Virtual Input 29		
VI 30	Virtual Input 30		
Setting Group Names			
Setting Group 1	Setting Group 1		
Setting Group 2	Setting Group 2		
Setting Group 3	Setting Group 3		

Setting Group 4	Setting Group 4		
Setting Group 5	Setting Group 5		
Setting Group 6	Setting Group 6		
Setting Group 7	Setting Group 7		
Setting Group 8	Setting Group 8		
System Parameters			
Phase Rotation	ABC		
Current Input #1 CT Ratio	240.00	:1 (Protection & Recording)	1.00 to 10000.00
Current Input #2 CT Ratio	300.00	:1 (Protection & Recording)	1.00 to 10000.00
Current Input #3 CT Ratio	400.00	:1 (Recording & ProLogic Input)	1.00 to 10000.00
Current Input #4 CT Ratio	500.00	:1 (Recording & ProLogic Input)	1.00 to 10000.00
Main PT Turns Ratio	2000.00	:1 (Protection & Recording)	1.00 to 20000.00
Auxiliary PT Turns Ratio	2000.00	:1 (Protection & Recording)	1.00 to 20000.00
Record Length			
Fault Record Length	1.5	s	0.2 to 10.0
Prefault Time	0.20	s	0.10 to 1.50
Swing Rcd. Length	120	s	60 to 120
Event Auto Save	Disabled		
Setting Group 1 [Setting Group 1]			
Setting Group Comments: Default settings			
Protection Summary			
59 Main	Disabled		
59 Aux	Disabled		
27 Main	Disabled		
27 Aux	Disabled		
50LS Current 1	Disabled		
50LS Current 2	Disabled		
50LS Current 3	Disabled		
50LS Current 4	Disabled		
50LS Summation 1	Disabled		
50LS Summation 2	Disabled		

50LS Summation 3	Disabled		
50LS Summation 4	Disabled		
Sub-Harmonic Detector			
Current 1 - Detector 1 [Current 1 Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Current 1 - Detector 2 [Current 1 Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		

Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Current 2 - Detector 1 [Current 2 Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Current 2 - Detector 2 [Current 2 Det 2]			

Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Current 3 - Detector 1 [Current 3 Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration

Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Current 3 - Detector 2 [Current 3 Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Current 4 - Detector 1 [Current 4 Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200

Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Current 4 - Detector 2 [Current 4 Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		

Main Voltage - Detector 1 [Main Voltage Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	5	% of 69V = 3.45V	1 to 15
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	5	%	1 to 15
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	5	%	1 to 15
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Main Voltage - Detector 2 [Main Voltage Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	5	% of 69V = 3.45V	1 to 15
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	5	%	1 to 15
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	5	%	1 to 15
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Aux Voltage - Detector 1 [Aux Voltage Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45

Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	5	% of 69V = 3.45V	1 to 15
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	5	%	1 to 15
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	5	%	1 to 15
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Aux Voltage - Detector 2 [Aux Voltage Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	5	% of 69V = 3.45V	1 to 15
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	5	%	1 to 15
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	5	%	1 to 15
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Summation 1 - Detector 1 [Summation 1 Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		

Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Summation 1 - Detector 2 [Summation 1 Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Summation 2 - Detector 1 [Summation 2 Det 1]			

Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per Minute	Disabled		
Operations per Minute Setting	20	operations/ minute	1 to 30
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Summation 2 - Detector 2 [Summation 2 Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per Minute	Disabled		
Operations per Minute Setting	20	operations/ minute	1 to 30
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200

Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Summation 3 - Detector 1 [Summation 3 Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Summation 3 - Detector 2 [Summation 3 Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200

Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Summation 4 - Detector 1 [Summation 4 Det 1]			
Pickup Delay	10.000	s	0.000 to 999.000
Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Summation 4 - Detector 2 [Summation 4 Det 2]			
Pickup Delay	10.000	s	0.000 to 999.000

Minimum Frequency	5	Hz	5 to 25
Maximum Frequency	25	Hz	5 to 45
Pickup counter alarm	0	None	0-99999
Nominal Ratio	Disabled		
Nominal Ratio Setting	100	% of 5A = 5.00A	1 to 200
Fundamental Ratio	Disabled		
Fundamental Ratio Setting	100	%	1 to 200
Total Sub-Harmonic Distortion	Disabled		
Total Distortion Ratio Setting	100	%	1 to 200
Operations per duration	Disabled		
Duration	1	Minutes	60
Operations per duration	20	Operations/ duration	30+ Duration
Second Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
Fifth Harmonic Blocking	Disabled		
Threshold	20	%	1 to 200
Cross Blocking	Enabled		
59 - Overvoltage			
59 Main	Disabled		
Gate Switch	AND		
Pickup	50.0	V	1.0 to 138.0
Pickup Delay	0.00	s	0.00 to 10.00
59 Auxiliary	Disabled		
Gate Switch	AND		
Pickup	50.0	V	1.0 to 138.0
Pickup Delay	0.00	s	0.00 to 10.00
27 - Undervoltage			
27 Main	Disabled		
Gate Switch	AND		
Pickup	10.0	V	1.0 to 120.0
Pickup Delay	0.00	s	0.00 to 10.00
27 Auxiliary	Disabled		
Gate Switch	AND		

Pickup	10.0	V	1.0 to 120.0
Pickup Delay	0.00	s	0.00 to 10.00
50LS - Low Set Overcurrent			
50LS Current 1	Disabled		
Pickup	0.50	A	0.10 to 50.0
Pickup Delay	0.00	s	0.00 to 10.00
50LS Current 2	Disabled		
Pickup	0.50	A	0.10 to 50.0
Pickup Delay	0.00	s	0.00 to 10.00
50LS Current 3	Disabled		
Pickup	0.50	A	0.10 to 50.0
Pickup Delay	0.00	s	0.00 to 10.00
50LS Current 4	Disabled		
Pickup	0.50	A	0.10 to 50.0
Pickup Delay	0.00	s	0.00 to 10.00
50LS Summation 1	Disabled		
Pickup	0.50	A	0.10 to 50.0
Pickup Delay	0.00	s	0.00 to 10.00
50LS Summation 2	Disabled		
Pickup	0.50	A	0.10 to 50.0
Pickup Delay	0.00	s	0.00 to 10.00
50LS Summation 3	Disabled		
Pickup	0.50	A	0.10 to 50.0
Pickup Delay	0.00	s	0.00 to 10.00
50LS Summation 4	Disabled		
Pickup	0.50	A	0.10 to 50.0
Pickup Delay	0.00	s	0.00 to 10.00
PL 1 [ProLogic 1]			
ProLogic 1	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			

Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 2 [ProLogic 2]			
ProLogic 2	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 3 [ProLogic 3]			
ProLogic 3	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 4 [ProLogic 4]			
ProLogic 4	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00

Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 5 [ProLogic 5]			
ProLogic 5	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 6 [ProLogic 6]			
ProLogic 6	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			

Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 7 [ProLogic 7]			
ProLogic 7	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 8 [ProLogic 8]			
ProLogic 8	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 9 [ProLogic 9]			
ProLogic 9	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			

Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 10 [ProLogic 10]			
ProLogic 10	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 11 [ProLogic 11]			
ProLogic 11	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			

Input E	<Unused = 0>		
PL 12 [ProLogic 12]			
ProLogic 12	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 13 [ProLogic 13]			
ProLogic 13	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 14 [ProLogic 14]			
ProLogic 14	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			

Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 15 [ProLogic 15]			
ProLogic 15	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 16 [ProLogic 16]			
ProLogic 16	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 17 [ProLogic 17]			

ProLogic 17	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 18 [ProLogic 18]			
ProLogic 18	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 19 [ProLogic 19]			
ProLogic 19	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			

Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 20 [ProLogic 20]			
ProLogic 20	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 21 [ProLogic 21]			
ProLogic 21	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 22 [ProLogic 22]			
ProLogic 22	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00

Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 23 [ProLogic 23]			
ProLogic 23	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
PL 24 [ProLogic 24]			
ProLogic 24	Disabled		
Pickup Delay	0.00	s	0.00 to 999.00
Dropout Delay	0.00	s	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			

Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 1 [Group Logic 1]			
Group Logic 1	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 2 [Group Logic 2]			
Group Logic 2	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 3 [Group Logic 3]			
Group Logic 3	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			

Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 4 [Group Logic 4]			
Group Logic 4	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 5 [Group Logic 5]			
Group Logic 5	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			

Input E	<Unused = 0>		
Group Logic 6 [Group Logic 6]			
Group Logic 6	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 7 [Group Logic 7]			
Group Logic 7	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 8 [Group Logic 8]			
Group Logic 8	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			

Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 9 [Group Logic 9]			
Group Logic 9	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 10 [Group Logic 10]			
Group Logic 10	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 11 [Group Logic 11]			

Group Logic 11	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 12 [Group Logic 12]			
Group Logic 12	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 13 [Group Logic 13]			
Group Logic 13	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			

Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 14 [Group Logic 14]			
Group Logic 14	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 15 [Group Logic 15]			
Group Logic 15	Disabled		
Setting Group to Activate	<none>		
Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		
Group Logic 16 [Group Logic 16]			
Group Logic 16	Disabled		
Setting Group to Activate	<none>		

Pickup Delay	0.00	seconds	0.00 to 999.00
Operator 1			
Input A	<Unused = 0>		
Operator 2			
Input B	<Unused = 0>		
Operator 3			
Input C	<Unused = 0>		
Operator 4			
Input D	<Unused = 0>		
Operator 5			
Input E	<Unused = 0>		

Appendix C Hardware Description

The relay is a complete line distance protection relay package designed and manufactured with high quality features and recording components. The following information describes the main hardware components of the relay:

Main Processor Board (MPB)

The MPB has two processor sub-systems which control the operation of the entire relay: the DSP processor and the control processor. The DSP sub-system interfaces to the RAIB, the DIB and the OCB and manages the protection features of the relay. The control processor manages the user interface and system control features of the relay. Both subsystems operate independently of each other and will continue to function even if the other sub-system fails.

The MPB provides the following functionality:

- DSP processor subsystem which interfaces to the RAIB, the DIB and the OCB and manages the protection features of the relay, with:
  - The floating point DSP to provide fast capture and manipulation of data.
  - RAM and reprogrammable non-volatile Flash memory. Allows operation independent of the control processor and supports field software updates.
- A control processor subsystem which manages the user interface and system control features of the relay, with
  - RAM and reprogrammable non-volatile Flash memory. Allows operation independent of the DSP processor and supports field software upgrades.
  - Settings and recordings stored in non-volatile memory.
  - Runs a Real Time Operating System (RTOS).
  - Provides Ethernet ports and RS-232 ports for modem, SCADA, COM and USB interfaces.
- A time synchronism processor with automatic detection of modulated and un-modulated IRIG-B
- A high speed link is provided between the DSP and control processor subsystems.
- Sophisticated fault detection and “watchdog” recovery hardware
- The MPB also provides the power supply for the entire unit. The power supply operating range is 48-250 Vdc, 100-240 Vac, +/-10%, 50/60 Hz. This wide operating range provides easier installation by eliminating power supply ordering options

Digital Input Board (DIB)

This board provides 9 digital input channels. Inputs are optically isolated, externally wetted, and factory preset to the customer’s requested voltage level of 48,125 or 250 Vdc. This board interfaces to the MPB.

Rear Panel Comm Board (RPCB)

The RPCB provides the relay with two RS-232 ports (Ports 122 and 123, DB9F), IRIG-B time synchronization input (Port 121, male BNC), internal modem connection (Port 118, RJ-11) and two Ethernet ports (Ports 119 and 120, RJ-45 or 100BASE-FX MM 1300nm ST, depending upon order specification). The RPCB interfaces to the MPB. Port 119 is the exception in that it interfaces to the GFPCB where it shares an internal switch with the front panel LAN port. The switch then interfaces to the MPB.

Output Contact Board (LOCB)

The LOCB provides 14 normally open contact outputs for relaying, alarms and control. It also provides one normally closed output contact for relay inoperative indication. This board interfaces to the MPB.

Relay AC Analog Sensor Boards (RASB)

Each relay has 3 RASBs. Two RASBs have 3 voltage transformer inputs and 3 current transformer inputs while the third RASB has 6 current transformer inputs. These boards provide 12 current and 6 voltage ac analog measurement inputs. The RASBs interface to the RAIB.

Relay AC Analog Input Board (RAIB)

The RAIB provides the analog to digital conversion of the 12 ac analog current inputs and the 6 ac analog voltage inputs. The sample rate is fixed at 96 samples/cycle. Each channel is simultaneously sampled using 16-bit analog to digital converters. The digitized data is sent to the MPB for processing and implementation of the protection algorithms.

- A time synchronism processor with automatic detection of modulated and un-modulated IRIG-B
- A high speed link is provided between the DSP and control processor subsystems.
- Sophisticated fault detection and “watchdog” recovery hardware
- The MPB also provides the power supply for the entire unit. The power supply operating range is 48-250 Vdc, 100-240 Vac, +/-10%, 50/60 Hz. This wide operating range provides easier installation by eliminating power supply ordering options

Graphics Front Panel Comm Board (GFPCB)

The GFPCB provides the front panel USB and Ethernet ports, the front panel status LEDs and interfaces the MPB to the FPDB. The MPB controls the state of the LEDs.

Graphics Front Panel Display Board (GFPDB)

The GFPDB provides the 240x128 monochrome graphics front panel display and the keypad. The keypad is used to navigate the menus on the display to control relay operation by a local user.

Appendix D Event Messages

The following is a list of event messages that are created in the relay for events including trips, alarms, external input assertions, and internal events such as setting changes. This list is referred to from multiple places in this manual.

S-PRO Event Messages

Event Log Messages	Notes
27 Main <phase information>: Trip	The possible phase information will be: • A • B • C • AB • BC • CA • ABC
27 Aux <phase information >: Trip	
59 Main <phase information >: Trip	
59 Aux <phase information >: Trip	
50LS I1 <phase information >: High	
50LS I2 <phase information >: High	
50LS I3 <phase information >: High	
50LS I4 <phase information >: High	
50LS Summation 1 <phase information >: High	
50LS Summation 2 <phase information >: High	
50LS Summation 3 <phase information >: High	
50LS Summation 4 <phase information >: High	
Sub-Harmonic Detector Name:SHD1: A <reason>, B <reason>, C <reason>	Current Sub-Harmonic Detector Names are user assigned: 4 channels nom: Nominal ratio fund: Fundamental ratio STHD opd: Operation per duration
Sub-Harmonic Detector Name:SHD2: A <reason>, B <reason>, C <reason>	
Sub-Harmonic Detector Name:SHD1: A <reason>, B <reason>, C <reason>	Main Voltage Sub-Harmonic Detector Names are user assigned nom: Nominal ratio fund: Fundamental ratio STHD opd: Operation per duration
Sub-Harmonic Detector Name:SHD2: A <reason>, B <reason>, C <reason>	
Sub-Harmonic Detector Name:SHD1: A <reason>, B <reason>, C <reason>	Aux Voltage Sub-Harmonic Detector Names are user assigned nom: Nominal ratio fund: Fundamental ratio STHD opd: Operation per duration
Sub-Harmonic Detector Name:SHD2: A <reason>, B <reason>, C <reason>	
Sub-Harmonic Detector Name:SHD1: A <reason>, B <reason>, C <reason>	Summation Current Sub-Harmonic Detector Names are user assigned: 4 channels nom: Nominal ratio fund: Fundamental ratio STHD opd: Operation per duration
Sub-Harmonic Detector Name:SHD2: A <reason>, B <reason>, C <reason>	
ProLogic Name: PLn: High	ProLogic outputs names are user assigned, n = 1-24
ProLogic Name: PLn: Low	
External Input Name: EIn: High	External input names are user assigned, n = 1-20
External Input Name: EIn: Low	
Virtual Input Name: VIn: High	Virtual Inputs Names are user assigned, n = 1-30
Virtual Input Name: VIn: Low	

S-PRO Event Messages	
Event Log Messages	**Notes**
Output Contact Name: OCn: Closed	Output Contact Names are user assigned, n = 1-21
Output Contact Name: OCn: Open	
New Settings loaded. Active group n.	n = 1-8
Manual Settings Load request, activate SGn	Manual or user-initiated settings change, n = 1-8
Manual Settings Load request completed	Completion of user-initiated settings change.
Changed Active Group from x to y: GLn	This message is logged when relay changes setting group automatically via group logic initiated setting group change, x = 1-8, y = 1-8, n = 1-16
User changed Active Group from x to y	This message is logged when the relay changes setting group via User initiated setting group change, x = 1-8, y = 1-8
Manual Trigger	This message is logged on user-initiated recording trigger
Unit Recalibrated	
Unit restarted	
User logged In	

Appendix E. Modbus RTU Communication Protocol

Metering values available through the Relay Control Panel and the Front Panel display are also available via the Modbus protocol. Additionally the Modbus protocol supports the reading of unit time and time of the readings and provides access to trip and alarm events. All metering readings can be frozen into a snapshot via the "Hold Readings" function (see Force Single Coil function, address 0).

Table E.12: Read Coil Status (Function Code 01)

Channel	Address	Values	
Hold Readings	1	0: Readings not held	1: Readings held
Reserved	257	Reserved	Reserved
Output Contact 1	513	0: Contact Inactive	1: Contact Active
Output Contact 2	514	0: Contact Inactive	1: Contact Active
Output Contact 3	515	0: Contact Inactive	1: Contact Active
Output Contact 4	516	0: Contact Inactive	1: Contact Active
Output Contact 5	517	0: Contact Inactive	1: Contact Active
Output Contact 6	518	0: Contact Inactive	1: Contact Active
Output Contact 7	519	0: Contact Inactive	1: Contact Active
Output Contact 8	520	0: Contact Inactive	1: Contact Active
Output Contact 9	521	0: Contact Inactive	1: Contact Active
Output Contact 10	522	0: Contact Inactive	1: Contact Active
Output Contact 11	523	0: Contact Inactive	1: Contact Active
Output Contact 12	524	0: Contact Inactive	1: Contact Active
Output Contact 13	525	0: Contact Inactive	1: Contact Active
Output Contact 14	526	0: Contact Inactive	1: Contact Active
Output Contact 15	527	0: Contact Inactive	1: Contact Active
Output Contact 16	528	0: Contact Inactive	1: Contact Active
Output Contact 17	529	0: Contact Inactive	1: Contact Active
Output Contact 18	530	0: Contact Inactive	1: Contact Active
Output Contact 19	531	0: Contact Inactive	1: Contact Active
Output Contact 20	532	0: Contact Inactive	1: Contact Active
Output Contact 21	533	0: Contact Inactive	1: Contact Active
SHD1 Current 1 Pickup	769	0: Off (inactive)	1: On (active)

Table E.12: Read Coil Status (Function Code 01)

Channel	Address	Values	
SHD1 Current 1 Trip	770	0: Off (inactive)	1: On (active)
SHD2 Current 1 Pickup	771	0: Off (inactive)	1: On (active)
SHD2 Current 1 Trip	772	0: Off (inactive)	1: On (active)
SHD1 Current 2 Pickup	773	0: Off (inactive)	1: On (active)
SHD1 Current 2 Trip	774	0: Off (inactive)	1: On (active)
SHD2 Current 2 Pickup	775	0: Off (inactive)	1: On (active)
SHD2 Current 2 Trip	776	0: Off (inactive)	1: On (active)
SHD1 Current 3 Pickup	777	0: Off (inactive)	1: On (active)
SHD1 Current 3 Trip	778	0: Off (inactive)	1: On (active)
SHD2 Current 3 Pickup	779	0: Off (inactive)	1: On (active)
SHD2 Current 3 Trip	780	0: Off (inactive)	1: On (active)
SHD1 Current 4 Pickup	781	0: Off (inactive)	1: On (active)
SHD1 Current 4 Trip	782	0: Off (inactive)	1: On (active)
SHD2 Current 4 Pickup	783	0: Off (inactive)	1: On (active)
SHD2 Current 4 Trip	784	0: Off (inactive)	1: On (active)
SHD1 Main Voltage Pickup	785	0: Off (inactive)	1: On (active)
SHD1 Main Voltage Trip	786	0: Off (inactive)	1: On (active)
SHD2 Main Voltage Pickup	787	0: Off (inactive)	1: On (active)
SHD2 Main Voltage Trip	788	0: Off (inactive)	1: On (active)
SHD1 Aux Voltage Pickup	789	0: Off (inactive)	1: On (active)
SHD1 Aux Voltage Trip	790	0: Off (inactive)	1: On (active)
SHD2 Aux Voltage Pickup	791	0: Off (inactive)	1: On (active)
SHD2 Aux Voltage Trip	792	0: Off (inactive)	1: On (active)
SHD1 Summation 1 Pickup	793	0: Off (inactive)	1: On (active)
SHD1 Summation 1 Trip	794	0: Off (inactive)	1: On (active)
SHD2 Summation 1 Pickup	795	0: Off (inactive)	1: On (active)
SHD2 Summation 1 Trip	796	0: Off (inactive)	1: On (active)
SHD1 Summation 2 Pickup	797	0: Off (inactive)	1: On (active)
SHD1 Summation 2 Trip	798	0: Off (inactive)	1: On (active)
SHD2 Summation 2 Pickup	799	0: Off (inactive)	1: On (active)
SHD2 Summation 2 Trip	800	0: Off (inactive)	1: On (active)
SHD1 Summation 3 Pickup	801	0: Off (inactive)	1: On (active)
SHD1 Summation 3 Trip	802	0: Off (inactive)	1: On (active)

Table E.12: Read Coil Status (Function Code 01)			
Channel	Address	Values	
SHD2 Summation 3 Pickup	803	0: Off (inactive)	1: On (active)
SHD2 Summation 3 Trip	804	0: Off (inactive)	1: On (active)
SHD1 Summation 4 Pickup	805	0: Off (inactive)	1: On (active)
SHD1 Summation 4 Trip	806	0: Off (inactive)	1: On (active)
SHD2 Summation 4 Pickup	807	0: Off (inactive)	1: On (active)
SHD2 Summation 4 Trip	808	0: Off (inactive)	1: On (active)
ProLogic 1	1025	0: Off (inactive)	1: On (active)
ProLogic 2	1026	0: Off (inactive)	1: On (active)
ProLogic 3	1027	0: Off (inactive)	1: On (active)
ProLogic 4	1028	0: Off (inactive)	1: On (active)
ProLogic 5	1029	0: Off (inactive)	1: On (active)
ProLogic 6	1030	0: Off (inactive)	1: On (active)
ProLogic 7	1031	0: Off (inactive)	1: On (active)
ProLogic 8	1032	0: Off (inactive)	1: On (active)
ProLogic 9	1033	0: Off (inactive)	1: On (active)
ProLogic 10	1034	0: Off (inactive)	1: On (active)
ProLogic 11	1035	0: Off (inactive)	1: On (active)
ProLogic 12	1036	0: Off (inactive)	1: On (active)
ProLogic 13	1037	0: Off (inactive)	1: On (active)
ProLogic 14	1038	0: Off (inactive)	1: On (active)
ProLogic 15	1039	0: Off (inactive)	1: On (active)
ProLogic 16	1040	0: Off (inactive)	1: On (active)
ProLogic 17	1041	0: Off (inactive)	1: On (active)
ProLogic 18	1042	0: Off (inactive)	1: On (active)
ProLogic 19	1043	0: Off (inactive)	1: On (active)
ProLogic 20	1044	0: Off (inactive)	1: On (active)
ProLogic 21	1045	0: Off (inactive)	1: On (active)
ProLogic 22	1046	0: Off (inactive)	1: On (active)
ProLogic 23	1047	0: Off (inactive)	1: On (active)
ProLogic 24	1048	0: Off (inactive)	1: On (active)
27 Main Pickup	1049	0: Off (inactive)	1: On (active)
27 Main Trip	1050	0: Off (inactive)	1: On (active)
27 Aux Pickup	1051	0: Off (inactive)	1: On (active)

Table E.12: Read Coil Status (Function Code 01)

Channel	Address	Values	
27 Aux Trip	1052	0: Off (inactive)	1: On (active)
59-1 Main Pickup	1053	0: Off (inactive)	1: On (active)
59-1 Main Trip	1054	0: Off (inactive)	1: On (active)
59-1 Aux Pickup	1055	0: Off (inactive)	1: On (active)
59-1 Aux Trip	1056	0: Off (inactive)	1: On (active)
59-2 Main Pickup	1057	0: Off (inactive)	1: On (active)
59-2 Main Trip	1058	0: Off (inactive)	1: On (active)
59-2 Aux Pickup	1059	0: Off (inactive)	1: On (active)
59-2 Aux Trip	1060	0: Off (inactive)	1: On (active)
50LS Current 1 Pickup	1061	0: Off (inactive)	1: On (active)
50LS Current 1 Trip	1062	0: Off (inactive)	1: On (active)
50LS Current 2 Pickup	1063	0: Off (inactive)	1: On (active)
50LS Current 2 Trip	1064	0: Off (inactive)	1: On (active)
50LS Current 3 Pickup	1065	0: Off (inactive)	1: On (active)
50LS Current 3 Trip	1066	0: Off (inactive)	1: On (active)
50LS Current 4 Pickup	1067	0: Off (inactive)	1: On (active)
50LS Current 4 Trip	1068	0: Off (inactive)	1: On (active)
50LS Summation 1 Pickup	1069	0: Off (inactive)	1: On (active)
50LS Summation 1 Trip	1070	0: Off (inactive)	1: On (active)
50LS Summation 2 Pickup	1071	0: Off (inactive)	1: On (active)
50LS Summation 2 Trip	1072	0: Off (inactive)	1: On (active)
50LS Summation 3 Pickup	1073	0: Off (inactive)	1: On (active)
50LS Summation 3 Trip	1074	0: Off (inactive)	1: On (active)
50LS Summation 4 Pickup	1075	0: Off (inactive)	1: On (active)
50LS Summation 4 Trip	1076	0: Off (inactive)	1: On (active)
SHD1 Current 1 Pickup Counter Alarm	1281	0: Off (inactive)	1: On (active)
SHD2 Current 1 Pickup Counter Alarm	1282	0: Off (inactive)	1: On (active)
SHD1 Current 2 Pickup Counter Alarm	1283	0: Off (inactive)	1: On (active)
SHD2 Current 2 Pickup Counter Alarm	1284	0: Off (inactive)	1: On (active)
SHD1 Current 3 Pickup Counter Alarm	1285	0: Off (inactive)	1: On (active)
SHD2 Current 3 Pickup Counter Alarm	1286	0: Off (inactive)	1: On (active)
SHD1 Current 4 Pickup Counter Alarm	1287	0: Off (inactive)	1: On (active)
SHD2 Current 4 Pickup Counter Alarm	1288	0: Off (inactive)	1: On (active)

Table E.12: Read Coil Status (Function Code 01)			
Channel	Address	Values	
SHD1 Main Voltage Pickup Counter Alarm	1289	0: Off (inactive)	1: On (active)
SHD2 Main Voltage Pickup Counter Alarm	1290	0: Off (inactive)	1: On (active)
SHD1 Aux Voltage Pickup Counter Alarm	1291	0: Off (inactive)	1: On (active)
SHD2 Aux Voltage Pickup Counter Alarm	1292	0: Off (inactive)	1: On (active)
SHD1 Summation 1 Pickup Counter Alarm	1293	0: Off (inactive)	1: On (active)
SHD2 Summation 1 Pickup Counter Alarm	1294	0: Off (inactive)	1: On (active)
SHD1 Summation 2 Pickup Counter Alarm	1295	0: Off (inactive)	1: On (active)
SHD2 Summation 2 Pickup Counter Alarm	1296	0: Off (inactive)	1: On (active)
SHD1 Summation 3 Pickup Counter Alarm	1297	0: Off (inactive)	1: On (active)
SHD2 Summation 3 Pickup Counter Alarm	1298	0: Off (inactive)	1: On (active)
SHD1 Summation 4 Pickup Counter Alarm	1299	0: Off (inactive)	1: On (active)
SHD2 Summation 4 Pickup Counter Alarm	1300	0: Off (inactive)	1: On (active)

Table E.13: Read Input Status (Function Code 02)			
Channel	**Address**	**Values**	
External Input 1	1001	0: Off (inactive)	1: On (active)
External Input 2	1002	0: Off (inactive)	1: On (active)
External Input 3	1003	0: Off (inactive)	1: On (active)
External Input 4	1004	0: Off (inactive)	1: On (active)
External Input 5	1005	0: Off (inactive)	1: On (active)
External Input 6	1006	0: Off (inactive)	1: On (active)
External Input 7	1007	0: Off (inactive)	1: On (active)
External Input 8	1008	0: Off (inactive)	1: On (active)
External Input 9	1009	0: Off (inactive)	1: On (active)
External Input 10	1010	0: Off (inactive)	1: On (active)
External Input 11	1011	0: Off (inactive)	1: On (active)
External Input 12	1012	0: Off (inactive)	1: On (active)
External Input 13	1013	0: Off (inactive)	1: On (active)
External Input 14	1014	0: Off (inactive)	1: On (active)
External Input 15	1015	0: Off (inactive)	1: On (active)
External Input 16	1016	0: Off (inactive)	1: On (active)

Table E.13: Read Input Status (Function Code 02)			
Channel	**Address**	**Values**	
External Input 17	1017	0: Off (inactive)	1: On (active)
External Input 18	1018	0: Off (inactive)	1: On (active)
External Input 19	1019	0: Off (inactive)	1: On (active)
External Input 20	1020	0: Off (inactive)	1: On (active)
External Input 1 Change of state latch	1257	0: Off (inactive)	1: On (active)
External Input 2 Change of state latch	1258	0: Off (inactive)	1: On (active)
External Input 3 Change of state latch	1259	0: Off (inactive)	1: On (active)
External Input 4 Change of state latch	1260	0: Off (inactive)	1: On (active)
External Input 5 Change of state latch	1261	0: Off (inactive)	1: On (active)
External Input 6 Change of state latch	1262	0: Off (inactive)	1: On (active)
External Input 7 Change of state latch	1263	0: Off (inactive)	1: On (active)
External Input 8 Change of state latch	1264	0: Off (inactive)	1: On (active)
External Input 9 Change of state latch	1265	0: Off (inactive)	1: On (active)
External Input 10 Change of state latch	1266	0: Off (inactive)	1: On (active)
External Input 11 Change of state latch	1267	0: Off (inactive)	1: On (active)
External Input 12 Change of state latch	1268	0: Off (inactive)	1: On (active)
External Input 13 Change of state latch	1269	0: Off (inactive)	1: On (active)
External Input 14 Change of state latch	1270	0: Off (inactive)	1: On (active)
External Input 15 Change of state latch	1271	0: Off (inactive)	1: On (active)
External Input 16 Change of state latch	1272	0: Off (inactive)	1: On (active)
External Input 17 Change of state latch	1273	0: Off (inactive)	1: On (active)
External Input 18 Change of state latch	1274	0: Off (inactive)	1: On (active)
External Input 19 Change of state latch	1275	0: Off (inactive)	1: On (active)
External Input 20 Change of state latch	1276	0: Off (inactive)	1: On (active)
Virtual Input 1	1513	0: Off (inactive)	1: On (active)
Virtual Input 2	1514	0: Off (inactive)	1: On (active)
Virtual Input 3	1515	0: Off (inactive)	1: On (active)
Virtual Input 4	1516	0: Off (inactive)	1: On (active)
Virtual Input 5	1517	0: Off (inactive)	1: On (active)
Virtual Input 6	1518	0: Off (inactive)	1: On (active)
Virtual Input 7	1519	0: Off (inactive)	1: On (active)
Virtual Input 8	1520	0: Off (inactive)	1: On (active)
Virtual Input 9	1521	0: Off (inactive)	1: On (active)

Table E.13: Read Input Status (Function Code 02)			
Channel	**Address**	**Values**	
Virtual Input 10	1522	0: Off (inactive)	1: On (active)
Virtual Input 11	1523	0: Off (inactive)	1: On (active)
Virtual Input 12	1524	0: Off (inactive)	1: On (active)
Virtual Input 13	1525	0: Off (inactive)	1: On (active)
Virtual Input 14	1526	0: Off (inactive)	1: On (active)
Virtual Input 15	1527	0: Off (inactive)	1: On (active)
Virtual Input 16	1528	0: Off (inactive)	1: On (active)
Virtual Input 17	1529	0: Off (inactive)	1: On (active)
Virtual Input 18	1530	0: Off (inactive)	1: On (active)
Virtual Input 19	1531	0: Off (inactive)	1: On (active)
Virtual Input 20	1532	0: Off (inactive)	1: On (active)
Virtual Input 21	1533	0: Off (inactive)	1: On (active)
Virtual Input 22	1534	0: Off (inactive)	1: On (active)
Virtual Input 23	1535	0: Off (inactive)	1: On (active)
Virtual Input 24	1536	0: Off (inactive)	1: On (active)
Virtual Input 25	1537	0: Off (inactive)	1: On (active)
Virtual Input 26	1538	0: Off (inactive)	1: On (active)
Virtual Input 27	1539	0: Off (inactive)	1: On (active)
Virtual Input 28	1540	0: Off (inactive)	1: On (active)
Virtual Input 29	1541	0: Off (inactive)	1: On (active)
Virtual Input 30	1542	0: Off (inactive)	1: On (active)

Table E.14: Read Holding Registers (Function Code 03)			
Channel	**Address**	**Values**	**Scale**
IED Clock Time (UTC). Read all in same query to ensure consistent time reading data			
Milliseconds	40001	0 – 999	1
Seconds	40002	0 – 59	1
Minutes	40003	0 – 59	1
Hours	40004	0 – 23	1
Day of Year	40005	1 – 365 (366 for leap years)	1
Year since 1900	40006	115 – 137	1
Synchronized to IRIGB	40007	0: No, 1: Yes	1
Time of Acquisition (UTC). Read all in same query to ensure consistent time reading data			
Milliseconds	40008	0 – 999	1
Seconds	40009	0 – 59	1
Minutes	40010	0 – 59	1
Hours	40011	0 – 23	1
Day of Year	40012	1 – 365 (366 for leap years)	1
Year since 1900	40013	115 – 137	1
Synchronized to IRIGB	40014	0: No, 1: Yes	1
Offset of UTC to IED Time	40015	Zone's complement half hours. North America is negative	1

Table E.15: Read Holding Registers (Function Code 03)			
Channel	Address	Units	Scale
Main Va Magnitude	40257	kV	0.1
Main Va Angle	40258	degrees	0.1
Main Vb Magnitude	40259	kV	0.1
Main Vb Angle	40260	degrees	0.1
Main Vc Magnitude	40261	kV	0.1
Main Vc Angle	40262	degrees	0.1
I1a Magnitude	40263	A	1
I1a Angle	40264	degrees	0.1
I1b Magnitude	40265	A	1

Table E.15: Read Holding Registers (Function Code 03)			
Channel	Address	Units	Scale
I1b Angle	40266	degrees	0.1
I1c Magnitude	40267	A	1
I1c Angle	40268	degrees	0.1
I2a Magnitude	40269	A	1
I2a Angle	40270	degrees	0.1
I2b Magnitude	40271	A	1
I2b Angle	40272	degrees	0.1
I2c Magnitude	40273	A	1
I2c Angle	40274	degrees	0.1
I3a Magnitude	40275	A	1
I3a Angle	40276	degrees	0.1
I3b Magnitude	40277	A	1
I3b Angle	40278	degrees	0.1
I3c Magnitude	40279	A	1
I3c Angle	40280	degrees	0.1
I4a Magnitude	40281	A	1
I4a Angle	40282	degrees	0.1
I4b Magnitude	40283	A	1
I4b Angle	40284	degrees	0.1
I4c Magnitude	40285	A	1
I4c Angle	40286	degrees	0.1
Aux Va Magnitude	40287	kV	0.1
Aux Va Angle	40288	degrees	0.1
Aux Vb Magnitude	40289	kV	0.1
Aux Vb Angle	40290	degrees	0.1
Aux Vc Magnitude	40291	kV	0.1
Aux Vc Angle	40292	degrees	0.1
Summation 1a Magnitude	40293	A	1
Summation 1a Angle	40294	degrees	0.1
Summation 1b Magnitude	40295	A	1
Summation 1b Angle	40296	degrees	0.1
Summation 1c Magnitude	40297	A	1
Summation 1c Angle	40298	degrees	0.1

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
Summation 2a Magnitude	40299	A	1
Summation 2a Angle	40300	degrees	0.1
Summation 2b Magnitude	40301	A	1
Summation 2b Angle	40302	degrees	0.1
Summation 2c Magnitude	40303	A	1
Summation 2c Angle	40304	degrees	0.1
Summation 3a Magnitude	40305	A	1
Summation 3a Angle	40306	degrees	0.1
Summation 3b Magnitude	40307	A	1
Summation 3b Angle	40308	degrees	0.1
Summation 3c Magnitude	40309	A	1
Summation 3c Angle	40310	degrees	0.1
Summation 4a Magnitude	40311	A	1
Summation 4a Angle	40312	degrees	0.1
Summation 4b Magnitude	40313	A	1
Summation 4b Angle	40314	degrees	0.1
Summation 4c Magnitude	40315	A	1
Summation 4c Angle	40316	degrees	0.1
Main V Fundamental Frequency	40317	Hz	0.01
Active settings group	40318	n/a	1
Power 1: P	40319	MW	150
Power 1: Q	40320	MVAr	150
Power 1: S	40321	MVA	150
Power 1: PF	40322	n/a	0.01
Power 2: P	40323	MW	150
Power 2: Q	40324	MVAr	150
Power 2: S	40325	MVA	150
Power 2: PF	40326	n/a	0.01
Power 1: Pa	40327	MW	0. 5
Power 1: Pb	40328	MW	50
Power 1: Pc	40329	MW	50
Power 1: Qa	40330	MVAr	50
Power 1: Qb	40331	MVAr	50

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
Power 1: Qc	40332	MVAr	50
Power 1: Sa	40333	MVA	50
Power 1: Sb	40334	MVA	50
Power 1: Sc	40335	MVA	50
Power 1: PFa	40336	n/a	0.01
Power 1: PFb	40337	n/a	0.01
Power 1: PFc	40338	n/a	0.01
Power 2: Pa	40339	MW	50
Power 2: Pb	40340	MW	50
Power 2: Pc	40341	MW	50
Power 2: Qa	40342	MVAr	50
Power 2: Qb	40343	MVAr	50
Power 2: Qc	40344	MVAr	50
Power 2: Sa	40345	MVA	50
Power 2: Sb	40346	MVA	50
Power 2: Sc	40347	MVA	50
Power 2: PFa	40348	n/a	0.01
Power 2: PFb	40349	n/a	0.01
Power 2: PFc	40350	n/a	0.01
Main Va TSHD	40513	%	0.01
Main Va SH Frequency #1	40514	Hz	0.01
Main Va SH Magnitude #1	40515	kV	0.1
Main Va SH Frequency #2	40516	Hz	0.01
Main Va SH Magnitude #2	40517	kV	0.1
Main Va SH Frequency #3	40518	Hz	0.01
Main Va SH Magnitude #3	40519	kV	0.1
Main Va SH Frequency #4	40520	Hz	0.01
Main Va SH Magnitude #4	40521	kV	0.1
Main Va SH Frequency #5	40522	Hz	0.01
Main Va SH Magnitude #5	40523	kV	0.1
Main Vb TSHD	40524	%	0.01
Main Vb SH Frequency #1	40525	Hz	0.01
Main Vb SH Magnitude #1	40526	kV	0.1

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
Main Vb SH Frequency #2	40527	Hz	0.01
Main Vb SH Magnitude #2	40528	kV	0.1
Main Vb SH Frequency #3	40529	Hz	0.01
Main Vb SH Magnitude #3	40530	kV	0.1
Main Vb SH Frequency #4	40531	Hz	0.01
Main Vb SH Magnitude #4	40532	kV	0.1
Main Vb SH Frequency #5	40533	Hz	0.01
Main Vb SH Magnitude #5	40534	kV	0.1
Main Vc TSHD	40535	%	0.01
Main Vc SH Frequency #1	40536	Hz	0.01
Main Vc SH Magnitude #1	40537	kV	0.1
Main Vc SH Frequency #2	40538	Hz	0.01
Main Vc SH Magnitude #2	40539	kV	0.1
Main Vc SH Frequency #3	40540	Hz	0.01
Main Vc SH Magnitude #3	40541	kV	0.1
Main Vc SH Frequency #4	40542	Hz	0.01
Main Vc SH Magnitude #4	40543	kV	0.1
Main Vc SH Frequency #5	40544	Hz	0.01
Main Vc SH Magnitude #5	40545	kV	0.1
Aux Va TSHD	40546	%	0.01
Aux Va SH Frequency #1	40547	Hz	0.01
Aux Va SH Magnitude #1	40548	kV	0.1
Aux Va SH Frequency #2	40549	Hz	0.01
Aux Va SH Magnitude #2	40550	kV	0.1
Aux Va SH Frequency #3	40551	Hz	0.01
Aux Va SH Magnitude #3	40552	kV	0.1
Aux Va SH Frequency #4	40553	Hz	0.01
Aux Va SH Magnitude #4	40554	kV	0.1
Aux Va SH Frequency #5	40555	Hz	0.01
Aux Va SH Magnitude #5	40556	kV	0.1
Aux Vb TSHD	40557	%	0.01
Aux Vb SH Frequency #1	40558	Hz	0.01
Aux Vb SH Magnitude #1	40559	kV	0.1

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
Aux Vb SH Frequency #2	40560	Hz	0.01
Aux Vb SH Magnitude #2	40561	kV	0.1
Aux Vb SH Frequency #3	40562	Hz	0.01
Aux Vb SH Magnitude #3	40563	kV	0.1
Aux Vb SH Frequency #4	40564	Hz	0.01
Aux Vb SH Magnitude #4	40565	kV	0.1
Aux Vb SH Frequency #5	40566	Hz	0.01
Aux Vb SH Magnitude #5	40567	kV	0.1
Aux Vc TSHD	40568	%	0.01
Aux Vc SH Frequency #1	40569	Hz	0.01
Aux Vc Magnitude #1	40570	kV	0.1
Aux Vc SH Frequency #2	40571	Hz	0.01
Aux Vc SH Magnitude #2	40572	kV	0.1
Aux Vc SH Frequency #3	40573	Hz	0.01
Aux Vc SH Magnitude #3	40574	kV	0.1
Aux Vc SH Frequency #4	40575	Hz	0.01
Aux Vc SH Magnitude #4	40576	kV	0.1
Aux Vc SH Frequency #5	40577	Hz	0.01
Aux Vc SH Magnitude #5	40578	kV	0.1
I1a TSHD	40769	%	0.01
I1a SH Frequency #1	40770	Hz	0.01
I1a SH Magnitude #1	40771	A	1
I1a SH Frequency #2	40772	Hz	0.01
I1a SH Magnitude #2	40773	A	1
I1a SH Frequency #3	40774	Hz	0.01
I1a SH Magnitude #3	40775	A	1
I1a SH Frequency #4	40776	Hz	0.01
I1a SH Magnitude #4	40777	A	1
I1a SH Frequency #5	40778	Hz	0.01
I1a SH Magnitude #5	40779	A	1
I1b TSHD	40780	%	0.01
I1b SH Frequency #1	40781	Hz	0.01
I1b SH Magnitude #1	40782	A	1

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
I1b SH Frequency #2	40783	Hz	0.01
I1b SH Magnitude #2	40784	A	1
I1b SH Frequency #3	40785	Hz	0.01
I1b SH Magnitude #3	40786	A	1
I1b SH Frequency #4	40787	Hz	0.01
I1b SH Magnitude #4	40788	A	1
I1b SH Frequency #5	40789	Hz	0.01
I1b SH Magnitude #5	40790	A	1
I1c TSHD	40791	%	0.01
I1c SH Frequency #1	40792	Hz	0.01
I1c SH Magnitude #1	40793	A	1
I1c SH Frequency #2	40794	Hz	0.01
I1c SH Magnitude #2	40795	A	1
I1c SH Frequency #3	40796	Hz	0.01
I1c SH Magnitude #3	40797	A	1
I1c SH Frequency #4	40798	Hz	0.01
I1c SH Magnitude #4	40799	A	1
I1c SH Frequency #5	40800	Hz	0.01
I1c SH Magnitude #5	40801	A	1
I2a TSHD	40802	%	0.01
I2a SH Frequency #1	40803	Hz	0.01
I2a SH Magnitude #1	40804	A	1
I2a SH Frequency #2	40805	Hz	0.01
I2a SH Magnitude #2	40806	A	1
I2a SH Frequency #3	40807	Hz	0.01
I2a SH Magnitude #3	40808	A	1
I2a SH Frequency #4	40809	Hz	0.01
I2a SH Magnitude #4	40810	A	1
I2a SH Frequency #5	40811	Hz	0.01
I2a SH Magnitude #5	40812	A	1
I2b TSHD	40813	%	0.01
I2b SH Frequency #1	40814	Hz	0.01
I2b SH Magnitude #1	40815	A	1

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
I2b SH Frequency #2	40816	Hz	0.01
I2b SH Magnitude #2	40817	A	1
I2b SH Frequency #3	40818	Hz	0.01
I2b SH Magnitude #3	40819	A	1
I2b SH Frequency #4	40820	Hz	0.01
I2b SH Magnitude #4	40821	A	1
I2b SH Frequency #5	40822	Hz	0.01
I2b SH Magnitude #5	40823	A	1
I2c TSHD	40824	%	0.01
I2c SH Frequency #1	40825	Hz	0.01
I2c SH Magnitude #1	40826	A	1
I2c SH Frequency #2	40827	Hz	0.01
I2c SH Magnitude #2	40828	A	1
I2c SH Frequency #3	40829	Hz	0.01
I2c SH Magnitude #3	40830	A	1
I2c SH Frequency #4	40831	Hz	0.01
I2c SH Magnitude #4	40832	A	1
I2c SH Frequency #5	40833	Hz	0.01
I2c SH Magnitude #5	40834	A	1
I3a TSHD	40835	%	0.01
I3a SH Frequency #1	40836	Hz	0.01
I3a SH Magnitude #1	40837	A	1
I3a SH Frequency #2	40838	Hz	0.01
I3a SH Magnitude #2	40839	A	1
I3a SH Frequency #3	40840	Hz	0.01
I3a SH Magnitude #3	40841	A	1
I3a SH Frequency #4	40842	Hz	0.01
I3a SH Magnitude #4	40843	A	1
I3a SH Frequency #5	40844	Hz	0.01
I3a SH Magnitude #5	40845	A	1
I3b TSHD	40846	%	0.01
I3b SH Frequency #1	40847	Hz	0.01
I3b SH Magnitude #1	40848	A	1

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
I3b SH Frequency #2	40849	Hz	0.01
I3b SH Magnitude #2	40850	A	1
I3b SH Frequency #3	40851	Hz	0.01
I3b SH Magnitude #3	40852	A	1
I3b SH Frequency #4	40853	Hz	0.01
I3b SH Magnitude #4	40854	A	1
I3b SH Frequency #5	40855	Hz	0.01
I3b SH Magnitude #5	40856	A	1
I3c TSHD	40857	%	0.01
I3c SH Frequency #1	40858	Hz	0.01
I3c SH Magnitude #1	40859	A	1
I3c SH Frequency #2	40860	Hz	0.01
I3c SH Magnitude #2	40861	A	1
I3c SH Frequency #3	40862	Hz	0.01
I3c SH Magnitude #3	40863	A	1
I3c SH Frequency #4	40864	Hz	0.01
I3c SH Magnitude #4	40865	A	1
I3c SH Frequency #5	40866	Hz	0.01
I3c SH Magnitude #5	40867	A	1
I4a TSHD	40868	%	0.01
I4a SH Frequency #1	40869	Hz	0.01
I4a SH Magnitude #1	40870	A	1
I4a SH Frequency #2	40871	Hz	0.01
I4a SH Magnitude #2	40872	A	1
I4a SH Frequency #3	40873	Hz	0.01
I4a SH Magnitude #3	40874	A	1
I4a SH Frequency #4	40875	Hz	0.01
I4a SH Magnitude #4	40876	A	1
I4a SH Frequency #5	40877	Hz	0.01
I4a SH Magnitude #5	40878	A	1
I4b TSHD	40879	%	0.01
I4b SH Frequency #1	40880	Hz	0.01
I4b SH Magnitude #1	40881	A	1

Table E.15: Read Holding Registers (Function Code 03)			
Channel	Address	Units	Scale
I4b SH Frequency #2	40882	Hz	0.01
I4b SH Magnitude #2	40883	A	1
I4b SH Frequency #3	40884	Hz	0.01
I4b SH Magnitude #3	40885	A	1
I4b SH Frequency #4	40886	Hz	0.01
I4b SH Magnitude #4	40887	A	1
I4b SH Frequency #5	40888	Hz	0.01
I4b SH Magnitude #5	40889	A	1
I4c TSHD	40890	%	0.01
I4c SH Frequency #1	40891	Hz	0.01
I4c SH Magnitude #1	40892	A	1
I4c SH Frequency #2	40893	Hz	0.01
I4c SH Magnitude #2	40894	A	1
I4c SH Frequency #3	40895	Hz	0.01
I4c SH Magnitude #3	40896	A	1
I4c SH Frequency #4	40897	Hz	0.01
I4c SH Magnitude #4	40898	A	1
I4c SH Frequency #5	40899	Hz	0.01
I4c SH Magnitude #5	40900	A	1
Summation 1a TSHD	41025	%	0.01
Summation 1a SH Frequency #1	41026	Hz	0.01
Summation 1a SH Magnitude #1	41027	A	0.5
Summation 1a SH Frequency #2	41028	Hz	0.01
Summation 1a SH Magnitude #2	41029	A	0.5
Summation 1a SH Frequency #3	41030	Hz	0.01
Summation 1a SH Magnitude #3	41031	A	0.5
Summation 1a SH Frequency #4	41032	Hz	0.01
Summation 1a SH Magnitude #4	41033	A	0.5
Summation 1a SH Frequency #5	41034	Hz	0.01
Summation 1a SH Magnitude #5	41035	A	0.5
Summation 1b TSHD	41036	%	0.01
Summation 1b SH Frequency #1	41037	Hz	0.01
Summation 1b SH Magnitude #1	41038	A	0.5

Table E.15: Read Holding Registers (Function Code 03)			
Channel	Address	Units	Scale
Summation 1b SH Frequency #2	41039	Hz	0.01
Summation 1b SH Magnitude #2	41040	A	0.5
Summation 1b SH Frequency #3	41041	Hz	0.01
Summation 1b SH Magnitude #3	41042	A	0.5
Summation 1b SH Frequency #4	41043	Hz	0.01
Summation 1b SH Magnitude #4	41044	A	0.5
Summation 1b SH Frequency #5	41045	Hz	0.01
Summation 1b SH Magnitude #5	41046	A	0.5
Summation 1c TSHD	41047	%	0.01
Summation 1c SH Frequency #1	41048	Hz	0.01
Summation 1c SH Magnitude #1	41049	A	0.5
Summation 1c SH Frequency #2	41050	Hz	0.01
Summation 1c SH Magnitude #2	41051	A	0.5
Summation 1c SH Frequency #3	41052	Hz	0.01
Summation 1c SH Magnitude #3	41053	A	0.5
Summation 1c SH Frequency #4	41054	Hz	0.01
Summation 1c SH Magnitude #4	41055	A	0.5
Summation 1c SH Frequency #5	41056	Hz	0.01
Summation 1c SH Magnitude #5	41057	A	0.5
Summation 2a TSHD	41058	%	0.01
Summation 2a SH Frequency #1	41059	Hz	0.01
Summation 2a SH Magnitude #1	41060	A	0.5
Summation 2a SH Frequency #2	41061	Hz	0.01
Summation 2a SH Magnitude #2	41062	A	0.5
Summation 2a SH Frequency #3	41063	Hz	0.01
Summation 2a SH Magnitude #3	41064	A	0.5
Summation 2a SH Frequency #4	41065	Hz	0.01
Summation 2a SH Magnitude #4	41066	A	0.5
Summation 2a SH Frequency #5	41067	Hz	0.01
Summation 2a SH Magnitude #5	41068	A	0.5
Summation 2b TSHD	41069	%	0.01
Summation 2b SH Frequency #1	41070	Hz	0.01
Summation 2b SH Magnitude #1	41071	A	0.5

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
Summation 2b SH Frequency #2	41072	Hz	0.01
Summation 2b SH Magnitude #2	41073	A	0.5
Summation 2b SH Frequency #3	41074	Hz	0.01
Summation 2b SH Magnitude #3	41075	A	0.5
Summation 2b SH Frequency #4	41076	Hz	0.01
Summation 2b SH Magnitude #4	41077	A	0.5
Summation 2b SH Frequency #5	41078	Hz	0.01
Summation 2b SH Magnitude #5	41079	A	0.5
Summation 2c TSHD	41080	%	0.01
Summation 2c SH Frequency #1	41081	Hz	0.01
Summation 2c SH Magnitude #1	41082	A	0.5
Summation 2c SH Frequency #2	41083	Hz	0.01
Summation 2c SH Magnitude #2	41084	A	0.5
Summation 2c SH Frequency #3	41085	Hz	0.01
Summation 2c SH Magnitude #3	41086	A	0.5
Summation 2c SH Frequency #4	41087	Hz	0.01
Summation 2c SH Magnitude #4	41088	A	0.5
Summation 2c SH Frequency #5	41089	Hz	0.01
Summation 2c SH Magnitude #5	41090	A	0.5
Summation 3a TSHD	41091	%	0.01
Summation 3a SH Frequency #1	41092	Hz	0.01
Summation 3a SH Magnitude #1	41093	A	0.5
Summation 3a SH Frequency #2	41094	Hz	0.01
Summation 3a SH Magnitude #2	41095	A	0.5
Summation 3a SH Frequency #3	41096	Hz	0.01
Summation 3a SH Magnitude #3	41097	A	0.5
Summation 3a SH Frequency #4	41098	Hz	0.01
Summation 3a SH Magnitude #4	41099	A	0.5
Summation 3a SH Frequency #5	41100	Hz	0.01
Summation 3a SH Magnitude #5	41101	A	0.5
Summation 3b TSHD	41102	%	0.01
Summation 3b SH Frequency #1	41103	Hz	0.01
Summation 3b SH Magnitude #1	41104	A	0.5

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
Summation 3b SH Frequency #2	41105	Hz	0.01
Summation 3b SH Magnitude #2	41106	A	0.5
Summation 3b SH Frequency #3	41107	Hz	0.01
Summation 3b SH Magnitude #3	41108	A	0.5
Summation 3b SH Frequency #4	41109	Hz	0.01
Summation 3b SH Magnitude #4	41110	A	0.5
Summation 3b SH Frequency #5	41111	Hz	0.01
Summation 3b SH Magnitude #5	41112	A	0.5
Summation 3c TSHD	41113	%	0.01
Summation 3c SH Frequency #1	41114	Hz	0.01
Summation 3c SH Magnitude #1	41115	A	0.5
Summation 3c SH Frequency #2	41116	Hz	0.01
Summation 3c SH Magnitude #2	41117	A	0.5
Summation 3c SH Frequency #3	41118	Hz	0.01
Summation 3c SH Magnitude #3	41119	A	0.5
Summation 3c SH Frequency #4	41120	Hz	0.01
Summation 3c SH Magnitude #4	41121	A	0.5
Summation 3c SH Frequency #5	41122	Hz	0.01
Summation 3c SH Magnitude #5	41123	A	0.5
Summation 4a TSHD	41124	%	0.01
Summation 4a SH Frequency #1	41125	Hz	0.01
Summation 4a SH Magnitude #1	41126	A	0.5
Summation 4a SH Frequency #2	41127	Hz	0.01
Summation 4a SH Magnitude #2	41128	A	0.5
Summation 4a SH Frequency #3	41129	Hz	0.01
Summation 4a SH Magnitude #3	41130	A	0.5
Summation 4a SH Frequency #4	41131	Hz	0.01
Summation 4a SH Magnitude #4	41132	A	0.5
Summation 4a SH Frequency #5	41133	Hz	0.01
Summation 4a SH Magnitude #5	41134	A	0.5
Summation 4b TSHD	41135	%	0.01
Summation 4b SH Frequency #1	41136	Hz	0.01
Summation 4b SH Magnitude #1	41137	A	0.5

Table E.15: Read Holding Registers (Function Code 03)

Channel	Address	Units	Scale
Summation 4b SH Frequency #2	41138	Hz	0.01
Summation 4b SH Magnitude #2	41139	A	0.5
Summation 4b SH Frequency #3	41140	Hz	0.01
Summation 4b SH Magnitude #3	41141	A	0.5
Summation 4b SH Frequency #4	41142	Hz	0.01
Summation 4b SH Magnitude #4	41143	A	0.5
Summation 4b SH Frequency #5	41144	Hz	0.01
Summation 4b SH Magnitude #5	41145	A	0.5
Summation 4c TSHD	41146	%	0.01
Summation 4c SH Frequency #1	41147	Hz	0.01
Summation 4c SH Magnitude #1	41148	A	0.5
Summation 4c SH Frequency #2	41149	Hz	0.01
Summation 4c SH Magnitude #2	41150	A	0.5
Summation 4c SH Frequency #3	41151	Hz	0.01
Summation 4c SH Magnitude #3	41152	A	0.5
Summation 4c SH Frequency #4	41153	Hz	0.01
Summation 4c SH Magnitude #4	41154	A	0.5
Summation 4c SH Frequency #5	41155	Hz	0.01
Summation 4c SH Magnitude #5	41156	A	0.5

Table E.16: Read Holding Registers (Function Code 04)

No input registers supported. Response from IED indicates “ILLEGAL FUNCTION”.

Table E.17: Force Single Coil (Function Code 05)

Only the “Hold Readings” coil can be forced. When active, this coil locks all coil, input and holding register readings simultaneously at their most recent available state.

Channel	Type	Address	Value
Hold Readings	Read/Write	01	0000: Readings updated normally (inactive) FF00: Hold readings (active)

Table E.18: Preset Single Register (Function Code 06)

Event Message Control (See below for details of use).			
Channel	**Address**	**Value**	**Scale**
Refresh event list	41281	No data required	N/A
Acknowledge the current event and get the next event	41282	No data required	N/A
Get the next event (without acknowledge)	41283	No data required	N/A
Event Buffer Size		100 events	

Table E.19: Diagnostic Subfunctions (Function Code 08)

Return Query Data (Subfunction 00)	This provides an echo of the submitted message
Restart Comm. Option (Subfunction 01)	This restarts the Modbus communications process.
Force Listen Only Mode (Subfunction 04)	No response is returned. IED enters "Listen Only" mode. This mode can only be exited by the "Restart Comm. Option" command.

Table E.20: Report Slave ID (Function Code 17 (Hex 11))

A fixed response is returned by the IED, including system model, version and issue numbers.			
Channel	**Type**	**Bytes**	**Value**
Model Number	Read Only	0 and 1	0xFA1 = 4001 decimal
Version Number	Read Only	2 and 3	Version number
Issue Number	Read Only	4 and 5	Issue number

- The S-PRO IED model number is 4001.
- Version and issue will each be positive integers, say X and Y.
- The S-PRO is defined as "Model 4001, Version X Issue Y".

Table E.21: Accessing S-PRO Event Information	
All S-PRO detector event messages displayed in the Event Log are available via Modbus. The following controls are available.	
Refresh Event List	(Function Code 6, address 41281): Fetches the latest events from the relay's event log and makes them available for Modbus access. The most recent event becomes the current event available for reading.
Acknowledge Current Event and Get Next Event	(Function Code 6, address 41282): Clears the current event from the read registers and places the next event into the read registers. An acknowledged event is no longer available for reading.
Get Next Event	(Function Code 6, address 41283): Places the next event in the read registers without acknowledging the current event. The current event will reappear in the list when the function Refresh Event List is used.
Size of Current Event Message	(Function Code 3, address 41284): Indicates the number of 16 bit registers used to contain the current event. Event data is stored with 2 characters per register. A reading of zero indicates that there are no unacknowledged events available in the current set. (NB. The function Refresh Event List can be used to check for new events that have occurred since the last Refresh Event List.)
Read Event Message	(Function Code 3, addresses 41286 – 41338): Contains the current message. Two ASCII characters are packed into each 16 bit register. All unused registers in the set are set to 0.

Appendix F. DNP3 Device Profile

Device Properties

This document shows the device capabilities and the current value of each parameter for the default unit configuration as defined in the default configuration file.

1.1 Device Identification	Capabilities	Current Value	If configurable, list methods
1.1.1 Device Function:	○ Master ● Outstation	○ Master ● Outstation	
1.1.2 Vendor Name:		ERLPhase Power Technologies Ltd.	
1.1.3 Device Name:		S-PRO 4001	
1.1.4 Device manufacturer's hardware version string:		NA	
1.1.5 Device manufacturer's software version string:		NA	
1.1.6 Device Profile Document Version Number:		V02.0, June 09, 2015	
1.1.7 DNP Levels Supported for:	Masters Only RequestsResponses ☐☐None ☐☐Level 1 ☐☐Level 2 ☐☐Level 3 Outstations Only Requests and Responses ☐None ☐Level 1 ☒Level 2 ☐Level 3		
1.1.8 Supported Function Blocks:	☐ Self-Address Reservation ☐ Object 0 - attribute objects ☐ Data Sets ☐ File Transfer ☐ Virtual Terminal ☐ Mapping to IEC 61850 Object Models defined in a DNP3 XML file		

1.1 Device Identification	**Capabilities**	**Current Value**	**If configurable, list methods**
1.1.9 Notable Additions:	• Start-stop (qualifier codes 0x00 and 0x01), limited quantity (qualifier codes 0x07 and 0x08) and indices (qualifier codes 0x17 and 0x28) for Binary Inputs, Binary Outputs and Analog Inputs (object groups 1, 10 and 30) • 32-bit and 16-bit Analog Inputs with and without flag (variations 1, 2, 3 and 4) • Analog Input events with time (variations 3 and 4) • Fault Location information as analog readings • Event Log messages as Object groups 110 and 111		
1.1.10 Methods to set Configurable Parameters:	☐ XML - Loaded via DNP3 File Transfer ☐ XML - Loaded via other transport mechanism ☐ Terminal - ASCII Terminal Command Line ☒ Software - Vendor software named S-PRO Offliner ☐ Proprietary file loaded via DNP3 file transfer ☐ Proprietary file loaded via other transport mechanism ☐ Direct - Keypad on device front panel ☐ Factory - Specified when device is ordered ☐ Protocol - Set via DNP3 (e.g. assign class) ☐ Other - explain ________________		
1.1.11 DNP3 XML files available On-Line:	RdWrFilenameDescription of Contents ☐ dnpDP.xml Complete Device Profile ☐ dnpDPcap.xml Device Profile Capabilities ☐ dnpDPcfg.xml Device Profile config. values ☐ ☐ _____*.xml ___________________ *The Complete Device Profile Document contains the capabilities, Current Value, and configurable methods columns. *The Device Profile Capabilities contains only the capabilities and configurable methods columns. *The Device Profile Config. Values contains only the Current Value column.	Not supported	
1.1.12 External DNP3 XML files available Off-line:	Rd WrFilenameDescription of Contents ☐ ☐ dnpDP.xml Complete Device Profile ☐ ☐ dnpDPcap.xml Device Profile Capabilities ☐ ☐ dnpDPcfg.xml Device Profile config. values ☐ ☐ _______*.xml ___________________ *The Complete Device Profile Document contains the capabilities, Current Value, and configurable methods columns. *The Device Profile Capabilities contains only the capabilities and configurable methods columns. *The Device Profile Config. Values contains only the Current Value column.	Not supported	
1.1.13 Connections Supported:	☒ Serial (complete section 1.2) ☒ IP Networking (complete section 1.3) ☐ Other, explain _____________________		

1.2 Serial Connections	Capabilities	Current Value	If configurable, list methods
1.2.1 Port Name	Port 3		
1.2.2 Serial Connection Parameters:	☐ Asynchronous - 8 Data Bits, 1 Start Bit, 1 Stop Bit, No Parity ☒ Other, explain - Asynchronous with selectable parity	Not configured for DNP	S-PRO Offliner
1.2.3 Baud Rate:	☐ Fixed at _______ ☐ Configurable, range _______ to _______ ☒ Configurable, selectable from 300, 1200, 2400, 9600, 19200, 38400 and 57600 ☐ Configurable, other, describe_______________	Not configured for DNP	S-PRO Offliner
1.2.4 Hardware Flow Control (Handshaking): Describe hardware signaling requirements of the interface. Where a transmitter or receiver is inhibited until a given control signal is asserted, it is considered to require that signal prior to sending or receiving characters. Where a signal is asserted prior to transmitting, that signal will be maintained active until after the end of transmission. Where a signal is asserted to enable reception, any data sent to the device when the signal is not active could be discarded.	☐ None **RS-232 / V.24 / V.28 Options:** Before Tx, Asserts: ☐ RTS ☐ DTR Before Rx, Asserts: ☐ RTS ☐ DTR Always Asserts: ☒ RTS ☒ DTR Before Tx, Requires: Asserted Deasserted ☐ ☐ CTS ☐ ☐ DCD ☐ ☐ DSR ☐ ☐ RI ☐ ☐ Rx Inactive Before Rx, Requires: AssertedDeasserted ☐ ☐ CTS ☐ ☐ DCD ☐ ☐ DSR ☐ ☐ RI Always Ignores: ☒ CTS ☒ DCD ☒ DSR ☒ RI Other, explain ____________ **RS-422 / V.11 Options:** ☐Requires Indication before Rx ☐Asserts Control before Tx ☐Other, explain ____________ **RS-485 Options:** ☐Requires Rx inactive before Tx ☐Other, explain ____________		
1.2.5 Interval to Request Link Status:	☒ Not Supported ☐ Fixed at_________ seconds ☐ Configurable, range _____ to ______ seconds ☐ Configurable, selectable from __,__,__ seconds ☐ Configurable, other, describe______________		
1.2.6 Supports DNP3 Collision Avoidance:	☒ No ☐ Yes, explain ______________________		

1.2 Serial Connections	Capabilities	Current Value	If configurable, list methods
1.2.7 Receiver Inter-character Timeout:	☒ Not checked ☐ No gap permitted ☐ Fixed at _____ bit times ☐ Fixed at _____ ms ☐ Configurable, range ____ to ____ bit times ☐ Configurable, range ____ to ____ ms ☐ Configurable, Selectable from __,__,__bit times ☐ Configurable, Selectable from ___, ___, ___ ms ☐ Configurable, other, describe______________ ☐ Variable, explain ____		
1.2.8 Inter-character gaps in transmission:	☒ None (always transmits with no inter-character gap) ☐ Maximum _____ bit times ☐ Maximum _____ ms		

1.3 IP Networking	Capabilities	Current Value	If configurable, list methods
1.3.1 Port Name	Port 119, Port 120		
1.3.2 Type of End Point:	☐ TCP Initiating (Master Only) ☒ TCP Listening (Outstation Only) ☐ TCP Dual (required for Masters) ☒ UDP Datagram (required)	Not configured for DNP	S-PRO Offliner
1.3.3 IP Address of this Device:		192.168.100.101	S-PRO Maintenance utilities
1.3.4 Subnet Mask:		Not set	S-PRO Maintenance utilities
1.3.5 Gateway IP Address:		Not set	S-PRO Maintenance utilities
1.3.6 Accepts TCP Connections or UDP Datagrams from:	☒ Allows all (show as *.*.*.* in 1.3.7) ☒ Limits based on an IP address ☒ Limits based on list of IP addresses ☐ Limits based on a wildcard IP address ☐ Limits based on list of wildcard IP addresses ☐ Other validation, explain_________________	Limits based on an IP address	S-PRO Offliner
1.3.7 IP Address(es) from which TCP Connections or UDP Datagrams are accepted:		192.168.1.1	S-PRO Offliner
1.3.8 TCP Listen Port Number:	☐ Not Applicable (Master w/o dual end point) ☐ Fixed at 20,000 ☒ Configurable, range 1025 to 32737 ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	20,000	S-PRO Offliner
1.3.9 TCP Listen Port Number of remote device:	☒ Not Applicable (Outstation w/o dual end point) ☐ Fixed at 20,000 ☐ Configurable, range _______ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	NA	
1.3.10 TCP Keep-alive timer:	☐ Fixed at ___________ms ☒ Configurable, range 5 to 3,600 s ☐ Configurable, selectable from ___,___,___ms ☐ Configurable, other, describe______________	Disabled	S-PRO Offliner
1.3.11 Local UDP port:	☐ Fixed at 20,000 ☒ Configurable, range 1025 to 32737 ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________ ☐ Let system choose (Master only)	20,000	S-PRO Offliner
1.3.12 Destination UDP port for DNP3 Requests (Master Only):		NA	
1.3.13 Destination UDP port for initial unsolicited null responses (UDP only Outstations):	☒ None ☐ Fixed at 20,000 ☐ Configurable, range _______ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	NA	

1.3 IP Networking	**Capabilities**	**Current Value**	**If configurable, list methods**
1.3.14 Destination UDP port for responses:	☐ None ☐ Fixed at 20,000 ☒ Configurable, range 1025 to 32737 ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe_______________ ☐ Use source port number	20,000	S-PRO Offliner
1.3.15 Multiple master connections (Outstations Only):	☒ Supports multiple masters (Outstations only) If supported, the following methods may be used: ☒ Method 1 (based on IP address) - required ☒ Method 2 (based on IP port number) - recommended ☒ Method 3 (browsing for static data) - optional	Method 1 (based on IP address)	S-PRO Offliner
1.3.16 Time synchronization support:	☐ DNP3 LAN procedure (function code 24) ☐ DNP3 Write Time (not recommended over LAN) ☐ Other, explain _________________________ ☒ Not Supported		

1.4 Link Layer	Capabilities	Current Value	If configurable, list methods
1.4.1 Data Link Address:	☐ Fixed at______ ☒ Configurable, range 1 to 65519 ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	1	S-PRO Offliner
1.4.2 DNP3 Source Address Validation:	☒ Never ☐ Always, one address allowed (shown in 1.4.3) ☐ Always, any one of multiple addresses allowed ☐ (each selectable as shown in 1.4.3) ☐ Sometimes, explain________________		
1.4.3 DNP3 Source Address(es) expected when Validation is Enabled:	☐ Configurable to any 16 bit DNP Data Link Address value ☐ Configurable, range _______ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	NA	
1.4.4 Self Address Support using address 0xFFFC:	☐ Yes (only allowed if configurable) ☒ No	NA	
1.4.5 Sends Confirmed User Data Frames:	☐ Always ☐ Sometimes, explain _____________________ ☐ Never ☒ Configurable, either always or never		S-PRO Offliner (to disable, set Data Link Time-out to 0)
1.4.6 Data Link Layer Confirmation Timeout:	☐ None ☒ Fixed at 2,000 ms ☐ Configurable, range _______ to _______ms ☐ Configurable, selectable from ___,___,___ms ☐ Configurable, other, describe______________ ☐ Variable, explain _______________________	2,000	
1.4.7 Maximum Data Link Retries:	☐ Never Retries ☒ Fixed at 3 ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	3	
1.4.8 Maximum number of octets Transmitted in a Data Link Frame:	☒ Fixed at 292 ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	292	
1.4.9 Maximum number of octets that can be Received in a Data Link Frame:	☒ Fixed at 292 ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	292	

1.5 Application Layer	**Capabilities**	**Current Value**	**If configurable, list methods**
1.5.1 Maximum number of octets Transmitted in an Application Layer Fragment other than File Transfer:	☒ Fixed at 2048 ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	2048	
1.5.2 Maximum number of octets Transmitted in an Application Layer Fragment containing File Transfer:	☐ Fixed at ___________ ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	NA	
1.5.3 Maximum number of octets that can be Received in an Application Layer Fragment:	☒ Fixed at 2048 ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________	2048	
1.5.4 Timeout waiting for Complete Application Layer Fragment:	☐ None ☒ Fixed at 2,000 ms ☐ Configurable, range _______ to _______ms ☐ Configurable, selectable from ___,___,___ms ☐ Configurable, other, describe______________ ☐ Variable, explain ______________________	2,000 ms	
1.5.5 Maximum number of objects allowed in a single control request for CROB (group 12):	☒ Fixed at 16 ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________ ☐ Variable, explain ______________________	16	
1.5.6 Maximum number of objects allowed in a single control request for Analog Outputs (group 41):	☐ Fixed at _ ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________ ☐ Variable, explain ______________________	Analog Outputs not supported	
1.5.7 Maximum number of objects allowed in a single control request for Data Sets (groups 85,86,87):	☐ Fixed at __ ☐ Configurable, range ________ to _______ ☐ Configurable, selectable from ____,____,____ ☐ Configurable, other, describe______________ ☐ Variable, explain ______________________	Data Sets not supported	
1.5.8 Supports mixing object groups (AOBs, CROBs and Data Sets) in the same control request:	☐ Not applicable - controls are not supported ☐ Yes ☒ No	Analog Outputs not supported	

1.6 Fill Out The Following Items For Outstations Only	Capabilities	Current Value	If configurable, list methods
1.6.1 Timeout waiting for Application Confirm of solicited response message:	☐ None ☒ Fixed at 5,000 ms ☐ Configurable, range _______ to _______ms ☐ Configurable, selectable from ___,___,___ms ☐ Configurable, other, describe______________ ☐ Variable, explain _______________________	5,000 ms	
1.6.2 How often is time synchronization required from the master?	☒ Never needs time ☐ Within ______ seconds after IIN1.4 is set ☐ Periodically every _______ seconds		
1.6.3 Device Trouble Bit IIN1.6:	☐ Never used ☒ Reason for setting: Unable to access requested data or execute CROB, assuming a valid request has been received		
1.6.4 File Handle Timeout:	☒ Not applicable, files not supported ☐ Fixed at______ ms ☐ Configurable, range _______ to _______ms ☐ Configurable, selectable from ___,___,___ms ☐ Configurable, other, describe______________ ☐ Variable, explain _______________________		
1.6.5 Event Buffer Overflow Behaviour:	☐ Discard the oldest event ☒ Discard the newest event ☐ Other, explain _________________________		
1.6.6 Event Buffer Organization:	• Single buffer for the Object Groups 2 and 32, size 200. • Separate buffer for the Object Group 111, size 100. • Separate buffer for the Fault Locator events, size 100.		
1.6.7 Sends Multi-Fragment Responses:	☒ Yes ☐ No		
1.6.8 DNP Command Settings preserved through a device reset:	☐ Assign Class ☐ Analog Deadbands ☐ Data Set Prototypes ☐ Data Set Descriptors	Not supported	

1.7 Outstation Unsolicited Response Support	Capabilities	Current Value	If configurable, list methods
1.7.1 Supports Unsolicited Reporting:	☒ Not Supported ☐ Configurable, selectable from On and Off	NA	

1.8 Outstation Performance	Capabilities	Current Value	If configurable, list methods
1.8.1 Maximum Time Base Drift (milliseconds per minute):		NA, not synchronized by DNP	
1.8.2 When does outstation set IIN1.4?	☒ Never ☐ Asserted at startup until first Time Synchronization request received ☐ Periodically, range ____to____ seconds ☐ Periodically, selectable from ____,____,___ seconds ☐ Range ____to____ seconds after last time sync ☐ Selectable from___,___,___seconds after last time sync ☐ When time error may have drifted by range ____to____ ms ☐ When time error may have drifted by selectable from ____,____,___	NA	
1.8.3 Maximum Internal Time Reference Error when set via DNP (ms):		NA	
1.8.4 Maximum Delay Measurement error (ms):		NA	
1.8.5 Maximum Response time (ms):		100 ms (for the case all supported points mapped to the DNP point lists)	S-PRO Offliner
1.8.6 Maximum time from start-up to IIN 1.4 assertion (ms):		NA	
1.8.7 Maximum Event Time-tag error for local Binary and Double-bit I/O (ms):		• 0.1736 ms for 60Hz systems • 0.2083 ms for 50 Hz systems	
1.8.8 Maximum Event Time-tag error for local I/O other than Binary and Double-bit data types (ms):		• 0.1736 ms for 60Hz systems • 0.2083 ms for 50 Hz systems	

Capabilities and Current Settings for Device Database

The following tables identify the capabilities and current settings for each DNP3 data type. Each data type also provides a table defining the data points available in the device, default point lists configuration and a description of how this information can be obtained in case of customized point configuration.

2.1 Single-Bit Binary Inputs Static (Steady-State) Group Number: 1 Event Group Number: 2	**Capabilities**	**Current Value**	**If configurable, list methods**
2.1.1 Static Variation reported when variation 0 requested:	☒ Variation 1 - Single-bit Packed format ☐ Variation 2 - Single-bit with flag ☐ Based on point Index (add column to table below)		
2.1.2 Event Variation reported when variation 0 requested:	☐ Variation 1 - without time ☒ Variation 2 - with absolute time ☐ Variation 3 - with relative time ☐ Based on point Index (add column to table below)		
2.1.3 Event reporting mode:	☐ Only most recent ☒ All events		
2.1.4 Binary Inputs included in Class 0 response:	☒ Always ☐ Never ☐ Only if point is assigned to Class 1, 2, or 3 ☐ Based on point Index (add column to table below)		S-PRO Offliner
2.1.5 Definition of Binary Input Point List:	☐ Fixed, list shown in table below ☒ Configurable ☐ Other, explain_____________________	Default list is shown in the table below	S-PRO Offliner

1. Binary Inputs are scanned with 1 ms resolution.

2. Binary Input data points are user selectable; the data points available in the device for any given Binary Input point selection can be obtained through the S-PRO Offliner software (see SCADA Setting Summary).

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
0	External Input 1	1	Inactive	Active	
1	External Input 2	1	Inactive	Active	
2	External Input 3	1	Inactive	Active	
3	External Input 4	1	Inactive	Active	
4	External Input 5	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
5	External Input 6	1	Inactive	Active	
6	External Input 7	1	Inactive	Active	
7	External Input 8	1	Inactive	Active	
8	External Input 9	1	Inactive	Active	
9	Virtual Input 1	1	Inactive	Active	
10	Virtual Input 2	1	Inactive	Active	
11	Virtual Input 3	1	Inactive	Active	
12	Virtual Input 4	1	Inactive	Active	
13	Virtual Input 5	1	Inactive	Active	
14	Virtual Input 6	1	Inactive	Active	
15	Virtual Input 7	1	Inactive	Active	
16	Virtual Input 8	1	Inactive	Active	
17	Virtual Input 9	1	Inactive	Active	
18	Virtual Input 10	1	Inactive	Active	
19	Virtual Input 11	1	Inactive	Active	
20	Virtual Input 12	1	Inactive	Active	
21	Virtual Input 13	1	Inactive	Active	
22	Virtual Input 14	1	Inactive	Active	
23	Virtual Input 15	1	Inactive	Active	
24	Virtual Input 16	1	Inactive	Active	
25	Virtual Input 17	1	Inactive	Active	
26	Virtual Input 18	1	Inactive	Active	
27	Virtual Input 19	1	Inactive	Active	
28	Virtual Input 20	1	Inactive	Active	
29	Virtual Input 21	1	Inactive	Active	
30	Virtual Input 22	1	Inactive	Active	
31	Virtual Input 23	1	Inactive	Active	
32	Virtual Input 24	1	Inactive	Active	
33	Virtual Input 25	1	Inactive	Active	
34	Virtual Input 26	1	Inactive	Active	
35	Virtual Input 27	1	Inactive	Active	
36	Virtual Input 28	1	Inactive	Active	
37	Virtual Input 29	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
38	Virtual Input 30	1	Inactive	Active	
39	SHD1 Current 1 Trip	1	Inactive	Active	
40	SHD2 Current 1 Trip	1	Inactive	Active	
41	SHD1 Current 2 Trip	1	Inactive	Active	
42	SHD2 Current 2 Trip	1	Inactive	Active	
43	SHD1 Current 3 Trip	1	Inactive	Active	
44	SHD2 Current 3 Trip	1	Inactive	Active	
45	SHD1 Current 4 Trip	1	Inactive	Active	
46	SHD1 Current 4 Trip	1	Inactive	Active	
47	SHD1 Main Voltage Trip	1	Inactive	Active	
48	SHD2 Main Voltage Trip	1	Inactive	Active	
49	SHD1 Aux Voltage Trip	1	Inactive	Active	
50	SHD2 Aux Voltage Trip	1	Inactive	Active	
51	SHD1 Summation 1 Trip	1	Inactive	Active	
52	SHD2 Summation 1 Trip	1	Inactive	Active	
53	SHD1 Summation 2 Trip	1	Inactive	Active	
54	SHD2 Summation 2 Trip	1	Inactive	Active	
55	SHD1 Summation 3 Trip	1	Inactive	Active	
56	SHD2 Summation 3 Trip	1	Inactive	Active	
57	SHD1 Summation 4 Trip	1	Inactive	Active	
58	SHD2 Summation 4 Trip	1	Inactive	Active	
59	27 Main Trip	1	Inactive	Active	
60	27 Aux Trip	1	Inactive	Active	
61	59 Main Trip	1	Inactive	Active	
62	59 Aux Trip	1	Inactive	Active	
63	50 LS Current 1 Trip	1	Inactive	Active	
64	50 LS Current 2 Trip	1	Inactive	Active	
65	50 LS Current 3 Trip	1	Inactive	Active	
66	50 LS Current 4 Trip	1	Inactive	Active	
67	50 LS Summation 1 Trip	1	Inactive	Active	
68	50 LS Summation 2 Trip	1	Inactive	Active	
69	50 LS Summation 3 Trip	1	Inactive	Active	
70	50 LS Summation 4 Trip	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
71	SHD1 Current 1 Pickup	1	Inactive	Active	
72	SHD2 Current 1 Pickup	1	Inactive	Active	
73	SHD1 Current 2 Pickup	1	Inactive	Active	
74	SHD2 Current 2 Pickup	1	Inactive	Active	
75	SHD1 Current 3 Pickup	1	Inactive	Active	
76	SHD2 Current 3 Pickup	1	Inactive	Active	
77	SHD1 Current 4 Pickup	1	Inactive	Active	
78	SHD2 Current 4 Pickup	1	Inactive	Active	
79	SHD1 Main Voltage Pickup	1	Inactive	Active	
80	SHD2 Main Voltage Pickup	1	Inactive	Active	
81	SHD1 Aux Voltage Pickup	1	Inactive	Active	
82	SHD2 Aux Voltage Pickup	1	Inactive	Active	
83	SHD1 Summation 1 Pickup	1	Inactive	Active	
84	SHD2 Summation 1 Pickup	1	Inactive	Active	
85	SHD1 Summation 2 Pickup	1	Inactive	Active	
86	SHD2 Summation 2 Pickup	1	Inactive	Active	
87	SHD1 Summation 3 Pickup	1	Inactive	Active	
88	SHD2 Summation 3 Pickup	1	Inactive	Active	
89	SHD1 Summation 4 Pickup	1	Inactive	Active	
90	SHD2 Summation 4 Pickup	1	Inactive	Active	
91	27 Main Pickup	1	Inactive	Active	
92	27 Aux Pickup	1	Inactive	Active	
93	59 Main Pickup	1	Inactive	Active	
94	59 Aux Pickup	1	Inactive	Active	
95	50 LS Current 1 Pickup	1	Inactive	Active	
96	50 LS Current 2 Pickup	1	Inactive	Active	
97	50 LS Current 3 Pickup	1	Inactive	Active	
98	50 LS Current 4 Pickup	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
99	50 LS Summation 1 Pickup	1	Inactive	Active	
100	50 LS Summation 2 Pickup	1	Inactive	Active	
101	50 LS Summation 3 Pickup	1	Inactive	Active	
102	50 LS Summation 4 Pickup	1	Inactive	Active	
103	Self Check Fail	1	Inactive	Active	
104	Time Sync Loss	1	Inactive	Active	
105	ProLogic1	1	Inactive	Active	
106	ProLogic2	1	Inactive	Active	
107	ProLogic3	1	Inactive	Active	
108	ProLogic4	1	Inactive	Active	
109	ProLogic5	1	Inactive	Active	
110	ProLogic6	1	Inactive	Active	
111	ProLogic7	1	Inactive	Active	
112	ProLogic8	1	Inactive	Active	
113	ProLogic9	1	Inactive	Active	
114	ProLogic10	1	Inactive	Active	
115	ProLogic11	1	Inactive	Active	
116	ProLogic12	1	Inactive	Active	
117	ProLogic13	1	Inactive	Active	
118	ProLogic14	1	Inactive	Active	
119	ProLogic15	1	Inactive	Active	
120	ProLogic16	1	Inactive	Active	
121	ProLogic17	1	Inactive	Active	
122	ProLogic18	1	Inactive	Active	
123	ProLogic19	1	Inactive	Active	
124	ProLogic20	1	Inactive	Active	
125	ProLogic21	1	Inactive	Active	
126	ProLogic22	1	Inactive	Active	
127	ProLogic23	1	Inactive	Active	
128	ProLogic24	1	Inactive	Active	
129	Output Contact 1	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
130	Output Contact 2	1	Open	Closed	
131	Output Contact 3	1	Open	Closed	
132	Output Contact 4	1	Open	Closed	
133	Output Contact 5	1	Open	Closed	
134	Output Contact 6	1	Open	Closed	
135	Output Contact 7	1	Open	Closed	
136	Output Contact 8	1	Open	Closed	
137	Output Contact 9	1	Open	Closed	
138	Output Contact 10	1	Open	Closed	
139	Output Contact 11	1	Open	Closed	
140	Output Contact 12	1	Open	Closed	
141	Output Contact 13	1	Open	Closed	
142	Output Contact 14	1	Open	Closed	
143*	Output Contact 15	1	Open	Closed	
144*	Output Contact 16	1	Open	Closed	
145*	Output Contact 17	1	Open	Closed	
146*	Output Contact 18	1	Open	Closed	
147*	Output Contact 19	1	Open	Closed	
148*	Output Contact 20	1	Open	Closed	
149*	Output Contact 21	1	Open	Closed	
150*	External Input 10	1	Inactive	Active	
151*	External Input 11	1	Inactive	Active	
152*	External Input 12	1	Inactive	Active	
153*	External Input 13	1	Inactive	Active	
154*	External Input 14	1	Inactive	Active	
155*	External Input 15	1	Inactive	Active	
156*	External Input 16	1	Inactive	Active	
157*	External Input 17	1	Inactive	Active	
158*	External Input 18	1	Inactive	Active	
159*	External Input 19	1	Inactive	Active	
160*	External Input 20	1	Inactive	Active	
161	59-2 Main Trip	1	Inactive	Active	
162	59-2 Aux Trip	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
163	59-2 Main Pickup	1	Inactive	Active	
164	59-2 Aux Pickup	1	Inactive	Active	
165	SHD1 Current 1 Pickup Counter Alarm	1	Inactive	Active	
166	SHD2 Current 1 Pickup Counter Alarm	1	Inactive	Active	
167	SHD1 Current 2 Pickup Counter Alarm	1	Inactive	Active	
168	SHD2 Current 2 Pickup Counter Alarm	1	Inactive	Active	
169	SHD1 Current 3 Pickup Counter Alarm	1	Inactive	Active	
170	SHD2 Current 3 Pickup Counter Alarm	1	Inactive	Active	
171	SHD1 Current 4 Pickup Counter Alarm	1	Inactive	Active	
172	SHD2 Current 4 Pickup Counter Alarm	1	Inactive	Active	
173	SHD1 Main Voltage Pickup Counter Alarm	1	Inactive	Active	
174	SHD2 Main Voltage Pickup Counter Alarm	1	Inactive	Active	
175	SHD1 Aux Voltage Pickup Counter Alarm	1	Inactive	Active	
176	SHD2 Aux Voltage Pickup Counter Alarm	1	Inactive	Active	
177	SHD1 Summation 1 Pickup Counter Alarm	1	Inactive	Active	
178	SHD2 Summation 1 Pickup Counter Alarm	1	Inactive	Active	
179	SHD1 Summation 2 Pickup Counter Alarm	1	Inactive	Active	
180	SHD2 Summation 2 Pickup Counter Alarm	1	Inactive	Active	
181	SHD1 Summation 3 Pickup Counter Alarm	1	Inactive	Active	
182	SHD2 Summation 3 Pickup Counter Alarm	1	Inactive	Active	
183	SHD1 Summation 4 Pickup Counter Alarm	1	Inactive	Active	
184	SHD2 Summation 4 Pickup Counter Alarm	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
185*	SHD1 Current 1 Trip A	1	Inactive	Active	
186*	SHD1 Current 1 Trip B	1	Inactive	Active	
187*	SHD1 Current 1 Trip C	1	Inactive	Active	
188*	SHD1 Current 1 Trip Nominal Ratio	1	Inactive	Active	
189*	SHD1 Current 1 Trip Fundamental Ratio	1	Inactive	Active	
190*	SHD1 Current 1 Trip TSHD	1	Inactive	Active	
191*	SHD1 Current 1 Trip Operations per Duration	1	Inactive	Active	
192*	SHD2 Current 1 Trip A	1	Inactive	Active	
193*	SHD2 Current 1 Trip B	1	Inactive	Active	
194*	SHD2 Current 1 Trip C	1	Inactive	Active	
195*	SHD2 Current 1 Trip Nominal Ratio	1	Inactive	Active	
196*	SHD2 Current 1 Trip Fundamental Ratio	1	Inactive	Active	
197*	SHD2 Current 1 Trip TSHD	1	Inactive	Active	
198*	SHD2 Current 1 Trip Operations per Duration	1	Inactive	Active	
199*	SHD1 Current 2 Trip A	1	Inactive	Active	
200*	SHD1 Current 2 Trip B	1	Inactive	Active	
201*	SHD1 Current 2 Trip C	1	Inactive	Active	
202*	SHD1 Current 2 Trip Nominal Ratio	1	Inactive	Active	
203*	SHD1 Current 2 Trip Fundamental Ratio	1	Inactive	Active	
204*	SHD1 Current 2 Trip TSHD	1	Inactive	Active	
205*	SHD1 Current 2 Trip Operations per Duration	1	Inactive	Active	
206*	SHD2 Current 2 Trip A	1	Inactive	Active	
207*	SHD2 Current 2 Trip B	1	Inactive	Active	
208*	SHD2 Current 2 Trip C	1	Inactive	Active	
209*	SHD2 Current 2 Trip Nominal Ratio	1	Inactive	Active	
210*	SHD2 Current 2 Trip Fundamental Ratio	1	Inactive	Active	
211*	SHD2 Current 2 Trip TSHD	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
212*	SHD2 Current 2 Trip Operations per Duration	1	Inactive	Active	
213*	SHD1 Current 3 Trip A	1	Inactive	Active	
214*	SHD1 Current 3 Trip B	1	Inactive	Active	
215*	SHD1 Current 3 Trip C	1	Inactive	Active	
216*	SHD1 Current 3 Trip Nominal Ratio	1	Inactive	Active	
217*	SHD1 Current 3 Trip Fundamental Ratio	1	Inactive	Active	
218*	SHD1 Current 3 Trip TSHD	1	Inactive	Active	
219*	SHD1 Current 3 Trip Operations per Duration	1	Inactive	Active	
220*	SHD2 Current 3 Trip A	1	Inactive	Active	
221*	SHD2 Current 3 Trip B	1	Inactive	Active	
222*	SHD2 Current 3 Trip C	1	Inactive	Active	
223*	SHD2 Current 3 Trip Nominal Ratio	1	Inactive	Active	
224*	SHD2 Current 3 Trip Fundamental Ratio	1	Inactive	Active	
225*	SHD2 Current 3 Trip TSHD	1	Inactive	Active	
226*	SHD2 Current 3 Trip Operations per Duration	1	Inactive	Active	
227*	SHD1 Current 4 Trip A	1	Inactive	Active	
228*	SHD1 Current 4 Trip B	1	Inactive	Active	
229*	SHD1 Current 4 Trip C	1	Inactive	Active	
230*	SHD1 Current 4 Trip Nominal Ratio	1	Inactive	Active	
231*	SHD1 Current 4 Trip Fundamental Ratio	1	Inactive	Active	
232*	SHD1 Current 4 Trip TSHD	1	Inactive	Active	
233*	SHD1 Current 4 Trip Operations per Duration	1	Inactive	Active	
234*	SHD2 Current 4 Trip A	1	Inactive	Active	
235*	SHD2 Current 4 Trip B	1	Inactive	Active	
236*	SHD2 Current 4 Trip C	1	Inactive	Active	
237*	SHD2 Current 4 Trip Nominal Ratio	1	Inactive	Active	
238*	SHD2 Current 4 Trip Fundamental Ratio	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
239*	SHD2 Current 4 Trip TSHD	1	Inactive	Active	
240*	SHD2 Current 4 Trip Operations per Duration	1	Inactive	Active	
241*	SHD1 Main Voltage Trip A	1	Inactive	Active	
242*	SHD1 Main Voltage Trip B	1	Inactive	Active	
243*	SHD1 Main Voltage Trip C	1	Inactive	Active	
244*	SHD1 Main Voltage Trip Nominal Ratio	1	Inactive	Active	
245*	SHD1 Main Voltage Trip Fundamental Ratio	1	Inactive	Active	
246*	SHD1 Main Voltage Trip TSHD	1	Inactive	Active	
247*	SHD1 Main Voltage Trip Operations per Duration	1	Inactive	Active	
248*	SHD2 Main Voltage Trip A	1	Inactive	Active	
249*	SHD2 Main Voltage Trip B	1	Inactive	Active	
250*	SHD2 Main Voltage Trip C	1	Inactive	Active	
251*	SHD2 Main Voltage Trip Nominal Ratio	1	Inactive	Active	
252*	SHD2 Main Voltage Trip Fundamental Ratio	1	Inactive	Active	
253*	SHD2 Main Voltage Trip TSHD	1	Inactive	Active	
254*	SHD2 Main Voltage Trip Operations per Duration	1	Inactive	Active	
255*	SHD1 Aux Voltage Trip A	1	Inactive	Active	
256*	SHD1 Aux Voltage Trip B	1	Inactive	Active	
257*	SHD1 Aux Voltage Trip C	1	Inactive	Active	
258*	SHD1 Aux Voltage Trip Nominal Ratio	1	Inactive	Active	
259*	SHD1 Aux Voltage Trip Fundamental Ratio	1	Inactive	Active	
260*	SHD1 Aux Voltage Trip TSHD	1	Inactive	Active	
261*	SHD1 Aux Voltage Trip Operations per Duration	1	Inactive	Active	
262*	SHD2 Aux Voltage Trip A	1	Inactive	Active	
263*	SHD2 Aux Voltage Trip B	1	Inactive	Active	
264*	SHD2 Aux Voltage Trip C	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
265*	SHD2 Aux Voltage Trip Nominal Ratio	1	Inactive	Active	
266*	SHD2 Aux Voltage Trip Fundamental Ratio	1	Inactive	Active	
267*	SHD2 Aux Voltage Trip TSHD	1	Inactive	Active	
268*	SHD2 Aux Voltage Trip Operations per Duration	1	Inactive	Active	
269*	SHD1 Summation 1 Trip A	1	Inactive	Active	
270*	SHD1 Summation 1 Trip B	1	Inactive	Active	
271*	SHD1 Summation 1 Trip C	1	Inactive	Active	
272*	SHD1 Summation 1 Trip Nominal Ratio	1	Inactive	Active	
273*	SHD1 Summation 1 Trip Fundamental Ratio	1	Inactive	Active	
274*	SHD1 Summation 1 Trip TSHD	1	Inactive	Active	
275*	SHD1 Summation 1 Trip Operations per Duration	1	Inactive	Active	
276*	SHD2 Summation 1 Trip A	1	Inactive	Active	
277*	SHD2 Summation 1 Trip B	1	Inactive	Active	
278*	SHD2 Summation 1 Trip C	1	Inactive	Active	
279*	SHD2 Summation 1 Trip Nominal Ratio	1	Inactive	Active	
280*	SHD2 Summation 1 Trip Fundamental Ratio	1	Inactive	Active	
281*	SHD2 Summation 1 Trip TSHD	1	Inactive	Active	
282*	SHD2 Summation 1 Trip Operations per Duration	1	Inactive	Active	
283*	SHD1 Summation 2 Trip A	1	Inactive	Active	
284*	SHD1 Summation 2 Trip B	1	Inactive	Active	
285*	SHD1 Summation 2 Trip C	1	Inactive	Active	
286*	SHD1 Summation 2 Trip Nominal Ratio	1	Inactive	Active	
287*	SHD1 Summation 2 Trip Fundamental Ratio	1	Inactive	Active	
288*	SHD1 Summation 2 Trip TSHD	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
289*	SHD1 Summation 2 Trip Operations per Duration	1	Inactive	Active	
290*	SHD2 Summation 2 Trip A	1	Inactive	Active	
291*	SHD2 Summation 2 Trip B	1	Inactive	Active	
292*	SHD2 Summation 2 Trip C	1	Inactive	Active	
293*	SHD2 Summation 2 Trip Nominal Ratio	1	Inactive	Active	
294*	SHD2 Summation 2 Trip Fundamental Ratio	1	Inactive	Active	
295*	SHD2 Summation 2 Trip TSHD	1	Inactive	Active	
296*	SHD2 Summation 2 Trip Operations per Duration	1	Inactive	Active	
297*	SHD1 Summation 3 Trip A	1	Inactive	Active	
298*	SHD1 Summation 3 Trip B	1	Inactive	Active	
299*	SHD1 Summation 3 Trip C	1	Inactive	Active	
300*	SHD1 Summation 3 Trip Nominal Ratio	1	Inactive	Active	
301*	SHD1 Summation 3 Trip Fundamental Ratio	1	Inactive	Active	
302*	SHD1 Summation 3 Trip TSHD	1	Inactive	Active	
303*	SHD1 Summation 3 Trip Operations per Duration	1	Inactive	Active	
304*	SHD2 Summation 3 Trip A	1	Inactive	Active	
305*	SHD2 Summation 3 Trip B	1	Inactive	Active	
306*	SHD2 Summation 3 Trip C	1	Inactive	Active	
307*	SHD2 Summation 3 Trip Nominal Ratio	1	Inactive	Active	
308*	SHD2 Summation 3 Trip Fundamental Ratio	1	Inactive	Active	
309*	SHD2 Summation 3 Trip TSHD	1	Inactive	Active	
310*	SHD2 Summation 3 Trip Operations per Duration	1	Inactive	Active	
311*	SHD1 Summation 4 Trip A	1	Inactive	Active	
312*	SHD1 Summation 4 Trip B	1	Inactive	Active	
313*	SHD1 Summation 4 Trip C	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
314*	SHD1 Summation 4 Trip Nominal Ratio	1	Inactive	Active	
315*	SHD1 Summation 4 Trip Fundamental Ratio	1	Inactive	Active	
316*	SHD1 Summation 4 Trip TSHD	1	Inactive	Active	
317*	SHD1 Summation 4 Trip Operations per Duration	1	Inactive	Active	
318*	SHD2 Summation 4 Trip A	1	Inactive	Active	
319*	SHD2 Summation 4 Trip B	1	Inactive	Active	
320*	SHD2 Summation 4 Trip C	1	Inactive	Active	
321*	SHD2 Summation 4 Trip Nominal Ratio	1	Inactive	Active	
322*	SHD2 Summation 4 Trip Fundamental Ratio	1	Inactive	Active	
323*	SHD2 Summation 4 Trip TSHD	1	Inactive	Active	
324*	SHD2 Summation 4 Trip Operations per Duration	1	Inactive	Active	
325*	27 Main Trip A	1	Inactive	Active	
326*	27 Main Trip B	1	Inactive	Active	
327*	27 Main Trip C	1	Inactive	Active	
328*	27 Aux Trip A	1	Inactive	Active	
329*	27 Aux Trip B	1	Inactive	Active	
330*	27 Aux Trip C	1	Inactive	Active	
331*	59-1 Main Trip A	1	Inactive	Active	
332*	59-1 Main Trip B	1	Inactive	Active	
333*	59-1 Main Trip C	1	Inactive	Active	
334*	59-2 Main Trip A	1	Inactive	Active	
335*	59-2 Main Trip B	1	Inactive	Active	
336*	59-2 Main Trip C	1	Inactive	Active	
337*	59-1 Aux Trip A	1	Inactive	Active	
338*	59-1 Aux Trip B	1	Inactive	Active	
339*	59-1 Aux Trip C	1	Inactive	Active	
340*	59-2 Aux Trip A	1	Inactive	Active	
341*	59-2 Aux Trip B	1	Inactive	Active	
342*	59-2 Aux Trip C	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
343*	50LS Current 1 Trip A	1	Inactive	Active	
344*	50LS Current 1 Trip B	1	Inactive	Active	
345*	50LS Current 1 Trip C	1	Inactive	Active	
346*	50LS Current 2 Trip A	1	Inactive	Active	
347*	50LS Current 2 Trip B	1	Inactive	Active	
348*	50LS Current 2 Trip C	1	Inactive	Active	
349*	50LS Current 3 Trip A	1	Inactive	Active	
350*	50LS Current 3 Trip B	1	Inactive	Active	
351*	50LS Current 3 Trip C	1	Inactive	Active	
352*	50LS Current 4 Trip A	1	Inactive	Active	
353*	50LS Current 4 Trip B	1	Inactive	Active	
354*	50LS Current 4 Trip C	1	Inactive	Active	
355*	50LS Summation 1 Trip A	1	Inactive	Active	
356*	50LS Summation 1 Trip B	1	Inactive	Active	
357*	50LS Summation 1 Trip C	1	Inactive	Active	
358*	50LS Summation 2 Trip A	1	Inactive	Active	
359*	50LS Summation 2 Trip B	1	Inactive	Active	
360*	50LS Summation 2 Trip C	1	Inactive	Active	
361*	50LS Summation 3 Trip A	1	Inactive	Active	
362*	50LS Summation 3 Trip B	1	Inactive	Active	
363*	50LS Summation 3 Trip C	1	Inactive	Active	
364*	50LS Summation 4 Trip A	1	Inactive	Active	
365*	50LS Summation 4 Trip B	1	Inactive	Active	
366*	50LS Summation 4 Trip C	1	Inactive	Active	
367*	SHD1 Current 1 Pickup A	1	Inactive	Active	
368*	SHD1 Current 1 Pickup B	1	Inactive	Active	
369*	SHD1 Current 1 Pickup C	1	Inactive	Active	
370*	SHD1 Current 1 Pickup Nominal Ratio	1	Inactive	Active	
371*	SHD1 Current 1 Pickup Fundamental Ratio	1	Inactive	Active	
372*	SHD1 Current 1 Pickup TSHD	1	Inactive	Active	
373*	SHD2 Current 1 Pickup A	1	Inactive	Active	
374*	SHD2 Current 1 Pickup B	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
375*	SHD2 Current 1 Pickup C	1	Inactive	Active	
376*	SHD2 Current 1 Pickup Nominal Ratio	1	Inactive	Active	
377*	SHD2 Current 1 Pickup Fundamental Ratio	1	Inactive	Active	
378*	SHD2 Current 1 Pickup TSHD	1	Inactive	Active	
379*	SHD1 Current 2 Pickup A	1	Inactive	Active	
380*	SHD1 Current 2 Pickup B	1	Inactive	Active	
381*	SHD1 Current 2 Pickup C	1	Inactive	Active	
382*	SHD1 Current 2 Pickup Nominal Ratio	1	Inactive	Active	
383*	SHD1 Current 2 Pickup Fundamental Ratio	1	Inactive	Active	
384*	SHD1 Current 2 Pickup TSHD	1	Inactive	Active	
385*	SHD2 Current 2 Pickup A	1	Inactive	Active	
386*	SHD2 Current 2 Pickup B	1	Inactive	Active	
387*	SHD2 Current 2 Pickup C	1	Inactive	Active	
388*	SHD2 Current 2 Pickup Nominal Ratio	1	Inactive	Active	
389*	SHD2 Current 2 Pickup Fundamental Ratio	1	Inactive	Active	
390*	SHD2 Current 2 Pickup TSHD	1	Inactive	Active	
391*	SHD1 Current 3 Pickup A	1	Inactive	Active	
392*	SHD1 Current 3 Pickup B	1	Inactive	Active	
393*	SHD1 Current 3 Pickup C	1	Inactive	Active	
394*	SHD1 Current 3 Pickup Nominal Ratio	1	Inactive	Active	
395*	SHD1 Current 3 Pickup Fundamental Ratio	1	Inactive	Active	
396*	SHD1 Current 3 Pickup TSHD	1	Inactive	Active	
397*	SHD2 Current 3 Pickup A	1	Inactive	Active	
398*	SHD2 Current 3 Pickup B	1	Inactive	Active	
399*	SHD2 Current 3 Pickup C	1	Inactive	Active	
400*	SHD2 Current 3 Pickup Nominal Ratio	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
401*	SHD2 Current 3 Pickup Fundamental Ratio	1	Inactive	Active	
402*	SHD2 Current 3 Pickup TSHD	1	Inactive	Active	
403*	SHD1 Current 4 Pickup A	1	Inactive	Active	
404*	SHD1 Current 4 Pickup B	1	Inactive	Active	
405*	SHD1 Current 4 Pickup C	1	Inactive	Active	
406*	SHD1 Current 4 Pickup Nominal Ratio	1	Inactive	Active	
407*	SHD1 Current 4 Pickup Fundamental Ratio	1	Inactive	Active	
408*	SHD1 Current 4 Pickup TSHD	1	Inactive	Active	
409*	SHD2 Current 4 Pickup A	1	Inactive	Active	
410*	SHD2 Current 4 Pickup B	1	Inactive	Active	
411*	SHD2 Current 4 Pickup C	1	Inactive	Active	
412*	SHD2 Current 4 Pickup Nominal Ratio	1	Inactive	Active	
413*	SHD2 Current 4 Pickup Fundamental Ratio	1	Inactive	Active	
414*	SHD2 Current 4 Pickup TSHD	1	Inactive	Active	
415*	SHD1 Main Voltage Pickup A	1	Inactive	Active	
416*	SHD1 Main Voltage Pickup B	1	Inactive	Active	
417*	SHD1 Main Voltage Pickup C	1	Inactive	Active	
418*	SHD1 Main Voltage Pickup Nominal Ratio	1	Inactive	Active	
419*	SHD1 Main Voltage Pickup Fundamental Ratio	1	Inactive	Active	
420*	SHD1 Main Voltage Pickup TSHD	1	Inactive	Active	
421*	SHD2 Main Voltage Pickup A	1	Inactive	Active	
422*	SHD2 Main Voltage Pickup B	1	Inactive	Active	
423*	SHD2 Main Voltage Pickup C	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
424*	SHD2 Main Voltage Pickup Nominal Ratio	1	Inactive	Active	
425*	SHD2 Main Voltage Pickup Fundamental Ratio	1	Inactive	Active	
426*	SHD2 Main Voltage Pickup TSHD	1	Inactive	Active	
427*	SHD1 Aux Voltage Pickup A	1	Inactive	Active	
428*	SHD1 Aux Voltage Pickup B	1	Inactive	Active	
429*	SHD1 Aux Voltage Pickup C	1	Inactive	Active	
430*	SHD1 Aux Voltage Pickup Nominal Ratio	1	Inactive	Active	
431*	SHD1 Aux Voltage Pickup Fundamental Ratio	1	Inactive	Active	
432*	SHD1 Aux Voltage Pickup TSHD	1	Inactive	Active	
433*	SHD2 Aux Voltage Pickup A	1	Inactive	Active	
434*	SHD2 Aux Voltage Pickup B	1	Inactive	Active	
435*	SHD2 Aux Voltage Pickup C	1	Inactive	Active	
436*	SHD2 Aux Voltage Pickup Nominal Ratio	1	Inactive	Active	
437*	SHD2 Aux Voltage Pickup Fundamental Ratio	1	Inactive	Active	
438*	SHD2 Aux Voltage Pickup TSHD	1	Inactive	Active	
439*	SHD1 Summation 1 Pickup A	1	Inactive	Active	
440*	SHD1 Summation 1 Pickup B	1	Inactive	Active	
441*	SHD1 Summation 1 Pickup C	1	Inactive	Active	
442*	SHD1 Summation 1 Pickup Nominal Ratio	1	Inactive	Active	
443*	SHD1 Summation 1 Pickup Fundamental Ratio	1	Inactive	Active	
444*	SHD1 Summation 1 Pickup TSHD	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
445*	SHD2 Summation 1 Pickup A	1	Inactive	Active	
446*	SHD2 Summation 1 Pickup B	1	Inactive	Active	
447*	SHD2 Summation 1 Pickup C	1	Inactive	Active	
448*	SHD2 Summation 1 Pickup Nominal Ratio	1	Inactive	Active	
449*	SHD2 Summation 1 Pickup Fundamental Ratio	1	Inactive	Active	
450*	SHD2 Summation 1 Pickup TSHD	1	Inactive	Active	
451*	SHD1 Summation 2 Pickup A	1	Inactive	Active	
452*	SHD1 Summation 2 Pickup B	1	Inactive	Active	
453*	SHD1 Summation 2 Pickup C	1	Inactive	Active	
454*	SHD1 Summation 2 Pickup Nominal Ratio	1	Inactive	Active	
455*	SHD1 Summation 2 Pickup Fundamental Ratio	1	Inactive	Active	
456*	SHD1 Summation 2 Pickup TSHD	1	Inactive	Active	
457*	SHD2 Summation 2 Pickup A	1	Inactive	Active	
458*	SHD2 Summation 2 Pickup B	1	Inactive	Active	
459*	SHD2 Summation 2 Pickup C	1	Inactive	Active	
460*	SHD2 Summation 2 Pickup Nominal Ratio	1	Inactive	Active	
461*	SHD2 Summation 2 Pickup Fundamental Ratio	1	Inactive	Active	
462*	SHD2 Summation 2 Pickup TSHD	1	Inactive	Active	
463*	SHD1 Summation 3 Pickup A	1	Inactive	Active	
464*	SHD1 Summation 3 Pickup B	1	Inactive	Active	
465*	SHD1 Summation 3 Pickup C	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
466*	SHD1 Summation 3 Pickup Nominal Ratio	1	Inactive	Active	
467*	SHD1 Summation 3 Pickup Fundamental Ratio	1	Inactive	Active	
468*	SHD1 Summation 3 Pickup TSHD	1	Inactive	Active	
469*	SHD2 Summation 3 Pickup A	1	Inactive	Active	
470*	SHD2 Summation 3 Pickup B	1	Inactive	Active	
471*	SHD2 Summation 3 Pickup C	1	Inactive	Active	
472*	SHD2 Summation 3 Pickup Nominal Ratio	1	Inactive	Active	
473*	SHD2 Summation 3 Pickup Fundamental Ratio	1	Inactive	Active	
474*	SHD2 Summation 3 Pickup TSHD	1	Inactive	Active	
475*	SHD1 Summation 4 Pickup A	1	Inactive	Active	
476*	SHD1 Summation 4 Pickup B	1	Inactive	Active	
477*	SHD1 Summation 4 Pickup C	1	Inactive	Active	
478*	SHD1 Summation 4 Pickup Nominal Ratio	1	Inactive	Active	
479*	SHD1 Summation 4 Pickup Fundamental Ratio	1	Inactive	Active	
480*	SHD1 Summation 4 Pickup TSHD	1	Inactive	Active	
481*	SHD2 Summation 4 Pickup A	1	Inactive	Active	
482*	SHD2 Summation 4 Pickup B	1	Inactive	Active	
483*	SHD2 Summation 4 Pickup C	1	Inactive	Active	
484*	SHD2 Summation 4 Pickup Nominal Ratio	1	Inactive	Active	
485*	SHD2 Summation 4 Pickup Fundamental Ratio	1	Inactive	Active	
486*	SHD2 Summation 4 Pickup TSHD	1	Inactive	Active	
487*	27 Main Pickup A	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
488*	27 Main Pickup B	1	Inactive	Active	
489*	27 Main Pickup C	1	Inactive	Active	
490*	27 Aux Pickup A	1	Inactive	Active	
491*	27 Aux Pickup B	1	Inactive	Active	
492*	27 Aux Pickup C	1	Inactive	Active	
493*	59-1 Main Pickup A	1	Inactive	Active	
494*	59-1 Main Pickup B	1	Inactive	Active	
495*	59-1 Main Pickup C	1	Inactive	Active	
496*	59-2 Main Pickup A	1	Inactive	Active	
497*	59-2 Main Pickup B	1	Inactive	Active	
498*	59-2 Main Pickup C	1	Inactive	Active	
499*	59-1 Aux Pickup A	1	Inactive	Active	
500*	59-1 Aux Pickup B	1	Inactive	Active	
501*	59-1 Aux Pickup C	1	Inactive	Active	
502*	59-2 Aux Pickup A	1	Inactive	Active	
503*	59-2 Aux Pickup B	1	Inactive	Active	
504*	59-2 Aux Pickup C	1	Inactive	Active	
505*	50LS Current 1 Pickup A	1	Inactive	Active	
506*	50LS Current 1 Pickup B	1	Inactive	Active	
507*	50LS Current 1 Pickup C	1	Inactive	Active	
508*	50LS Current 2 Pickup A	1	Inactive	Active	
509*	50LS Current 2 Pickup B	1	Inactive	Active	
510*	50LS Current 2 Pickup C	1	Inactive	Active	
511*	50LS Current 3 Pickup A	1	Inactive	Active	
512*	50LS Current 3 Pickup B	1	Inactive	Active	
513*	50LS Current 3 Pickup C	1	Inactive	Active	
514*	50LS Current 4 Pickup A	1	Inactive	Active	
515*	50LS Current 4 Pickup B	1	Inactive	Active	
516*	50LS Current 4 Pickup C	1	Inactive	Active	
517*	50LS Summation 1 Pickup A	1	Inactive	Active	
518*	50LS Summation 1 Pickup B	1	Inactive	Active	
519*	50LS Summation 1 Pickup C	1	Inactive	Active	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
520*	50LS Summation 2 Pickup A	1	Inactive	Active	
521*	50LS Summation 2 Pickup B	1	Inactive	Active	
522*	50LS Summation 2 Pickup C	1	Inactive	Active	
523*	50LS Summation 3 Pickup A	1	Inactive	Active	
524*	50LS Summation 3 Pickup B	1	Inactive	Active	
525*	50LS Summation 3 Pickup C	1	Inactive	Active	
526*	50LS Summation 4 Pickup A	1	Inactive	Active	
527*	50LS Summation 4 Pickup B	1	Inactive	Active	
528*	50LS Summation 4 Pickup C	1	Inactive	Active	

2.2 Binary Output Status And Control Relay Output Block Binary Output Status Group Number: 10 Binary Output Event Group Number: 11 CROB Group Number: 12 Binary Output Command Event Object Num: 13	**Capabilities**	**Current Value**	**If configurable, list methods**
2.2.1 Minimum pulse time allowed with Trip, Close, and Pulse On commands:	☒ Fixed at 0.000 ms (hardware may limit this further) ☐ Based on point Index (add column to table below)		
2.2.2 Maximum pulse time allowed with Trip, Close, and Pulse On commands:	☒ Fixed at 0.000 ms (hardware may limit this further) ☐ Based on point Index (add column to table below)		
2.2.3 Binary Output Status included in Class 0 response:	☒ Always ☐ Never ☐ Only if point is assigned to Class 1, 2, or 3 ☐ Based on point Index (add column to table below)		
2.2.4 Reports Output Command Event Objects:	☒ Never ☐ Only upon a successful Control ☐ Upon all control attempts	Not supported	
2.2.5 Event Variation reported when variation 0 requested:	☐ Variation 1 - without time ☐ Variation 2 - with absolute time ☐ Based on point Index (add column to table below)	Not supported	S-PRO Offliner (See Note 2 below)
2.2.6 Command Event Variation reported when variation 0 requested:	☐ Variation 1 - without time ☐ Variation 2 - with absolute time ☐ Based on point Index (add column to table below)	Not supported	S-PRO Offliner (See Note 2 below)
2.2.7 Event reporting mode:	☐ Only most recent ☐ All events	Not supported	S-PRO Offliner (See Note 2 below)
2.2.8 Command Event reporting mode:	☐ Only most recent ☐ All events	Not supported	
2.2.9 Maximum Time between Select and Operate:	☐ Not Applicable ☒ Fixed at 10 seconds ☐ Configurable, range ______ to ______ seconds ☐ Configurable, selectable from___,___,___seconds ☐ Configurable, other, describe______________ ☐ Variable, explain _______________________ ☐ Based on point Index (add column to table below)	10 s	
2.2.10 Definition of Binary Output Status/Control relay output block (CROB) Point List:	☐ Fixed, list shown in table below ☒ Configurable ☐ Other, explain_____________________	Default list is shown in the table below	S-PRO Offliner

NOTES	1. Binary Outputs are scanned with 500 ms resolution. 2. Events are not supported for Binary Outputs (group 10), but most of Binary Output points can be mapped to Binary Inputs (group 2) with full Event and Class Data support. See S-PRO Offliner/DNP Configuration/Point Map screen for complete point lists and configuration options. 3. Virtual Inputs (default Binary Output points 14-43) can be used to control relay output contacts. See S-PRO Offliner/Setting Group X/Output Matrix screen for configuration options. 4. Binary Output data points are user selectable; the data points available in the device for any given Binary Output point selection can be obtained through the S-PRO Offliner software (see SCADA Setting Summary).

Point Index	Name	Supported Control Operations											Name for State when value is 0	Name for State when value is 1	Default Class Assigned to Events (1, 2, 3 or none)		Description
		Select/Operate	Direct Operate	Direct Operate - No Ack	Pulse On / NUL	Pulse Off	Latch On / NUL	Latch Off / NUL	Trip	Close	Count > 1	Cancel Currently Running Operation			Change	Command	
0	Output contact 1	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
1	Output contact 2	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
2	Output contact 3	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
3	Output contact 4	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
4	Output contact 5	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
5	Output contact 6	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
6	Output contact 7	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
7	Output contact 8	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
8	Output contact 9	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
9	Output contact 10	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
10	Output contact 11	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
11	Output contact 12	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
12	Output contact 13	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
13	Output contact 14	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
14	Virtual Input 1	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
15	Virtual Input 2	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
16	Virtual Input 3	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
17	Virtual Input 4	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
18	Virtual Input 5	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s

Point Index	Name	Supported Control Operations											Name for State when value is 0	Name for State when value is 1	Default Class Assigned to Events (1, 2, 3 or none)		Description
		Select/Operate	Direct Operate	Direct Operate - No Ack	Pulse On / NUL	Pulse Off	Latch On / NUL	Latch Off / NUL	Trip	Close	Count > 1	Cancel Currently Running Operation			Change	Command	
19	Virtual Input 6	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
20	Virtual Input 7	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
21	Virtual Input 8	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
22	Virtual Input 9	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
23	Virtual Input 10	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
24	Virtual Input 11	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
25	Virtual Input 12	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
26	Virtual Input 13	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
27	Virtual Input 14	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
28	Virtual Input 15	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
29	Virtual Input 16	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
30	Virtual Input 17	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
31	Virtual Input 18	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
32	Virtual Input 19	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
33	Virtual Input 20	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
34	Virtual Input 21	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
35	Virtual Input 22	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
36	Virtual Input 23	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
37	Virtual Input 24	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
38	Virtual Input 25	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
39	Virtual Input 26	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
40	Virtual Input 27	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
41	Virtual Input 28	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
42	Virtual Input 29	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
43	Virtual Input 30	Y	Y	Y	Y	-	Y	Y	-	-	-	-	Inactive	Active	None	None	Pulse duration fixed at 1 s
44*	Output Contact 15	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
45*	Output Contact 16	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	

Point Index	Name	Supported Control Operations											Name for State when value is 0	Name for State when value is 1	Default Class Assigned to Events (1, 2, 3 or none)		Description
		Select/Operate	Direct Operate	Direct Operate - No Ack	Pulse On / NUL	Pulse Off	Latch On / NUL	Latch Off / NUL	Trip	Close	Count > 1	Cancel Currently Running Operation			Change	Command	
46*	Output Contact 17	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
47*	Output Contact 18	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
48*	Output Contact 19	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
49*	Output Contact 20	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	
50*	Output Contact 21	-	-	-	-	-	-	-	-	-	-	-	Inactive	Active	None	None	

2.3 Analog Input Points Static (Steady-State) Group Number: 30 Event Group Number: 32	**Capabilities**	**Current Value**	**If configurable, list methods**
2.3.1 Static Variation reported when variation 0 requested:	☐ Variation 1 - 32-bit with flag ☐ Variation 2 - 16-bit with flag ☐ Variation 3 - 32-bit without flag ☒ Variation 4 - 16-bit without flag ☐ Variation 5 - single-precision floating point with flag ☐ Variation 6 - double-precision floating point with flag ☐ Based on point Index (add column to table below)		
2.3.2 Event Variation reported when variation 0 requested:	☐ Variation 1 - 32-bit without time ☒ Variation 2 - 16-bit without time ☐ Variation 3 - 32-bit with time ☐ Variation 4 - 16-bit with time ☐ Variation 5 - single-precision floating point w/o time ☐ Variation 6 - double-precision floating point w/o time ☐ Variation 7 - single-precision floating point with time ☐ Variation 8 - double-precision floating point with time ☐ Based on point Index (add column to table below)		
2.3.3 Event reporting mode:	☐ Only most recent ☒ All events		
2.3.4 Analog Inputs Included in Class 0 response:	☒ Always ☐ Never ☐ Only if point is assigned to Class 1, 2, or 3 ☐ Based on point Index (add column to table below)		
2.3.5 How Deadbands are set:	☐ A. Global Fixed ☐ B. Configurable through DNP ☒ C. Configurable via other means ☐ D. Other, explain ________________________ ☐ Based on point Index - column specifies which of the options applies, B, C, or D		S-PRO Offliner
2.3.6 Analog Deadband Algorithm: simple - just compares the difference from the previous reported value	☒ Simple ☐ Integrating ☐ Other, explain __________________________		
2.3.7 Definition of Analog Input Point List:	☐ Fixed, list shown in table below ☒ Configurable ☐ Other, explain_____________________	Default list is shown in table below	S-PRO Offliner

NOTES	1. Analog Inputs are scanned with 500 ms resolution. 2. Nominal values in calculations for the following table are based on 69V secondary voltage * PT ratio for voltage channels, and either 1 A or 5A secondary current * CT ratio for current channels dependent upon the format of CT installed in the S-PRO. 3. Analog Input data points are user selectable; the data points available in the device for any given Analog Input point selection can be obtained through the S-PRO Offliner software (see SCADA Setting Summary).

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
0	Main Va Magnitude	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	KV	0.1 / 0.00001	
1	Main Va Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
2	Main Vb Magnitude	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	KV	0.1 / 0.00001	
3	Main Vb Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
4	Main Vc Magnitude	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	KV	0.1 / 0.00001	
5	Main Vc Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
6	I1a Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
7	I1a Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
8	I1b Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
9	I1b Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
10	I1c Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
11	I1c Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
12	I2a Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
13	I2a Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
14	I2b Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
15	I2b Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
16	I2c Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
17	I2c Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
18	I3a Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
19	I3a Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
20	I3b Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	degrees	0.1 / 0.01	
21	I3b Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
22	I3c Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
23	I3c Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
24	I4a Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
25	I4a Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
26	I4b Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
27	I4b Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
28	I4c Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
29	I4c Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
30	Aux. Va Magnitude	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	KV	0.1 / 0.00001	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
31	Aux. Va Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
32	Aux. Vb Magnitude	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	KV	0.1 / 0.00001	
33	Aux. Vb Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
34	Aux. Vc Magnitude	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	KV	0.1 / 0.00001	
35	Aux. Vc Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
36	Summation 1a Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
37	Summation 1a Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
38	Summation 1b Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
39	Summation 1b Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
40	Summation 1c Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
41	Summation 1c Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
42	Summation 2a Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
43	Summation 2a Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
44	Summation 2b Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
45	Summation 2b Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
46	Summation 2c Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
47	Summation 2c Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
48	Summation 3a Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
49	Summation 3a Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
50	Summation 3b Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
51	Summation 3b Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
52	Summation 3c Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
53	Summation 3c Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
54	Summation 4a Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
55	Summation 4a Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
56	Summation 4b Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
57	Summation 4b Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
58	Summation 4c Magnitude	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
59	Summation 4c Angle	2	-18,000	18,000	0.1 / (0.01 – 1.0)	0.0	degrees	0.1 / 0.01	
60	Main Voltage Frequency	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
61	Active Setting Group Number	2	1	8	1.0	0.0	NA	1.0	
62	Main Va TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
63	Main Va SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
64	Main Va SH Magnitude #1	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
65	Main Va SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
66	Main Va SH Magnitude #2	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
67	Main Va SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
68	Main Va SH Magnitude #3	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
69	Main Va SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
70	Main Va SH Magnitude #4	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
71	Main Va SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
72	Main Va SH Magnitude #5	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
73	Main Vb TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
74	Main Vb SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
75	Main Vb SH Magnitude #1	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
76	Main Vb SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
77	Main Vb SH Magnitude #2	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
78	Main Vb SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
79	Main Vb SH Magnitude #3	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
80	Main Vb SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
81	Main Vb SH Magnitude #4	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
82	Main Vb SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
83	Main Vb SH Magnitude #5	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
84	Main Vc TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
85	Main Vc SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
86	Main Vc SH Magnitude #1	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
87	Main Vc SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
88	Main Vc SH Magnitude #2	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
89	Main Vc SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
90	Main Vc SH Magnitude #3	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
91	Main Vc SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
92	Main Vc SH Magnitude #4	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
93	Main Vc SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
94	Main Vc SH Magnitude #5	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
95	Aux Va TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
96	Aux Va SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
97	Aux Va SH Magnitude #1	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
98	Aux Va SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
99	Aux Va SH Magnitude #2	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a] Minimum	Transmitted Value[a] Maximum[d]	Scaling[b] Multiplier (default/ (range))	Scaling[b] Offset	Units	Resolution[c] (default/ maximal)	Description
100	Aux Va SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
101	Aux Va SH Magni-tude #3	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
102	Aux Va SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
103	Aux Va SH Magni-tude #4	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
104	Aux Va SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
105	Aux Va SH Magni-tude #5	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
106	Aux Vb TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
107	Aux Vb SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
108	Aux Vb SH Magnitude #1	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
109	Aux Vb SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
110	Aux Vb SH Magnitude #2	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
111	Aux Vb SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
112	Aux Vb SH Magnitude #3	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
113	Aux Vb SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
114	Aux Vb SH Magnitude #4	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
115	Aux Vb SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
116	Aux Vb SH Magnitude #5	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
117	Aux Vc TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
118	Aux Vc SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
119	Aux Vc SH Magnitude #1	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
120	Aux Vc SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
121	Aux Vc SH Magnitude #2	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
122	Aux Vc SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
123	Aux Vc SH Magnitude #3	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
124	Aux Vc SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
125	Aux Vc SH Magnitude #4	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
126	Aux Vc SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
127	Aux Vc SH Magnitude #5	2	0	Configurable	0.1 / (0.00001- 1.0)	0.0	kV	0.1 / 0.00001	
128	I1a TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
129	I1a SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
130	I1a SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
131	I1a SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
132	I1a SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
133	I1a SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
134	I1a SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
135	I1a SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
136	I1a SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
137	I1a SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
138	I1a SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
139	I1b TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
140	I1b SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
141	I1b SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
142	I1b SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
143	I1b SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
144	I1b SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
145	I1b SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
146	I1b SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
147	I1b SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
148	I1b SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
149	I1b SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
150	I1c TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
151	I1c SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
152	I1c SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
153	I1c SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
154	I1c SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
155	I1c SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
156	I1c SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
157	I1c SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
158	I1c SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
159	I1c SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
160	I1c SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
161	I2a TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
162	I2a SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
163	I2a SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
164	I2a SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
165	I2a SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
166	I2a SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
167	I2a SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
168	I2a SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
169	I2a SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
170	I2a SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
171	I2a SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
172	I2b TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
173	I2b SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
174	I2b SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
175	I2b SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
176	I2b SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
177	I2b SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
178	I2b SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
179	I2b SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
180	I2b SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
181	I2b SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
182	I2b SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
183	I2c TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
184	I2c SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
185	I2c SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
186	I2c SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
187	I2c SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
188	I2c SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
189	I2c SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
190	I2c SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
191	I2c SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
192	I2c SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
193	I2c SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
194	I3a TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
195	I3a SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
196	I3a SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
197	I3a SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
198	I3a SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
199	I3a SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
200	I3a SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
201	I3a SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
202	I3a SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
203	I3a SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
204	I3a SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
205	I3b TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
206	I3b SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
207	I3b SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
208	I3b SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
209	I3b SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
210	I3b SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
211	I3b SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
212	I3b SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
213	I3b SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
214	I3b SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
215	I3b SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
216	I3c TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
217	I3c SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
218	I3c SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
219	I3c SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
220	I3c SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
221	I3c SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
222	I3c SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
223	I3c SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
224	I3c SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
225	I3c SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
226	I3c SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
227	I4a TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
228	I4a SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
229	I4a SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
230	I4a SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
231	I4a SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
232	I4a SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
233	I4a SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
234	I4a SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
235	I4a SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
236	I4a SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
237	I4a SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
238	I4b TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
239	I4b SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
240	I4b SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
241	I4b SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
242	I4b SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
243	I4b SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
244	I4b SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
245	I4b SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
246	I4b SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
247	I4b SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
248	I4b SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
249	I4c TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
250	I4c SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
251	I4c SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
252	I4c SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
253	I4c SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
254	I4c SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
255	I4c SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
256	I4c SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
257	I4c SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
258	I4c SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
259	I4c SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
260	Summation 1a TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
261	Summation 1a SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
262	Summation 1a SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
263	Summation 1a SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
264	Summation 1a SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
265	Summation 1a SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
266	Summation 1a SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
267	Summation 1a SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
268	Summation 1a SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
269	Summation 1a SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
270	Summation 1a SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
271	Summation 1b TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
272	Summation 1b SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
273	Summation 1b SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
274	Summation 1b SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
275	Summation 1b SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
276	Summation 1b SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
277	Summation 1b SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
278	Summation 1b SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
279	Summation 1b SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
280	Summation 1b SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
281	Summation 1b SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
282	Summation 1c TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
283	Summation 1c SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
284	Summation 1c SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
285	Summation 1c SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
286	Summation 1c SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
287	Summation 1c SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
288	Summation 1c SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
289	Summation 1c SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
290	Summation 1c SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
291	Summation 1c SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
292	Summation 1c SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
293	Summation 2a TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
294	Summation 2a SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
295	Summation 2a SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
296	Summation 2a SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
297	Summation 2a SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
298	Summation 2a SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
299	Summation 2a SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
300	Summation 2a SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
301	Summation 2a SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
302	Summation 2a SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
303	Summation 2a SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
304	Summation 2b TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
305	Summation 2b SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
306	Summation 2b SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
307	Summation 2b SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
308	Summation 2b SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
309	Summation 2b SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
310	Summation 2b SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
311	Summation 2b SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
312	Summation 2b SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
313	Summation 2b SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
314	Summation 2b SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
315	Summation 2c TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
316	Summation 2c SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
317	Summation 2c SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
318	Summation 2c SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
319	Summation 2c SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
320	Summation 2c SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
321	Summation 2c SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
322	Summation 2c SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
323	Summation 2c SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
324	Summation 2c SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
325	Summation 2c SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
326	Summation 3a TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
327	Summation 3a SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
328	Summation 3a SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
329	Summation 3a SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
330	Summation 3a SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
331	Summation 3a SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
332	Summation 3a SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
333	Summation 3a SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
334	Summation 3a SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
335	Summation 3a SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
336	Summation 3a SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
337	Summation 3b TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
338	Summation 3b SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
339	Summation 3b SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
340	Summation 3b SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
341	Summation 3b SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
342	Summation 3b SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
343	Summation 3b SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
344	Summation 3b SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
345	Summation 3b SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
346	Summation 3b SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
347	Summation 3b SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
348	Summation 3c TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
349	Summation 3c SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
350	Summation 3c SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
351	Summation 3c SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
352	Summation 3c SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
353	Summation 3c SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
354	Summation 3c SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
355	Summation 3c SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
356	Summation 3c SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
357	Summation 3c SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
358	Summation 3c SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
359	Summation 4a TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
360	Summation 4a SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
361	Summation 4a SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
362	Summation 4a SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
363	Summation 4a SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
364	Summation 4a SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
365	Summation 4a SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
366	Summation 4a SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
367	Summation 4a SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
368	Summation 4a SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
369	Summation 4a SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
370	Summation 4b TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
371	Summation 4b SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
372	Summation 4b SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
373	Summation 4b SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
374	Summation 4b SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
375	Summation 4b SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
376	Summation 4b SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
377	Summation 4b SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
378	Summation 4b SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
379	Summation 4b SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
380	Summation 4b SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
381	Summation 4c TSHD	2	0	Configurable	0.1 / (0.01- 1.0)	0.0	%	0.1 / 0.01	
382	Summation 4c SH Frequency #1	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
383	Summation 4c SH Magnitude #1	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
384	Summation 4c SH Frequency #2	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
385	Summation 4c SH Magnitude #2	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
386	Summation 4c SH Frequency #3	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
387	Summation 4c SH Magnitude #3	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
388	Summation 4c SH Frequency #4	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
389	Summation 4c SH Magnitude #4	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
390	Summation 4c SH Frequency #5	2	0	Configurable	0.01 / (0.001 – 1.0)	0.0	Hz	0.01 / 0.001	
391	Summation 4c SH Magnitude #5	2	0	Configurable	1.0 / (0.01 – 1000)	0.0	A	1.0 / 0.01	
392	Power 1: P	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MW	0.1 / 0.00001	
393	Power 1: Q	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVAr	0.1 / 0.00001	
394	Power 1: S	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVA	0.1 / 0.00001	
395	Power 1: PF	2	-1000.0	1000.0	0.01 / (0.001 – 1.0)	0.0	N/A	0.01/ 0.001	
396	Power 2: P	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MW	0.1 / 0.00001	
397	Power 2: Q	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVAr	0.1 / 0.00001	
398	Power 2: S	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVA	0.1 / 0.00001	
399	Power 2: PF	2	-1000.0	1000.0	0.01 / (0.001 – 1.0)	0.0	N/A	0.01/ 0.001	
400	Power 1: Pa	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MW	0.1 / 0.00001	
401	Power 1: Pb	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MW	0.1 / 0.00001	
402	Power 1: Pc	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MW	0.1 / 0.00001	
403	Power 1: Qa	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVAr	0.1 / 0.00001	
404	Power 1: Qb	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVAr	0.1 / 0.00001	
405	Power 1: Qc	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVAr	0.1 / 0.00001	

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value[a]		Scaling[b]		Units	Resolution[c] (default/ maximal)	Description
			Minimum	Maximum[d]	Multiplier (default/ (range))	Offset			
406	Power 1: Sa	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVA	0.1 / 0.00001	
407	Power 1: Sb	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVA	0.1 / 0.00001	
408	Power 1: Sc	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVA	0.1 / 0.00001	
409	Power 1: PFa	2	-1000.0	1000.0	0.01 / (0.001 – 1.0)	0.0	N/A	0.01/ 0.001	
410	Power 1: PFb	2	-1000.0	1000.0	0.01 / (0.001 – 1.0)	0.0	N/A	0.01/ 0.001	
411	Power 1: PFc	2	-1000.0	1000.0	0.01 / (0.001 – 1.0)	0.0	N/A	0.01/ 0.001	
412	Power 2: Pa	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MW	0.1 / 0.00001	
413	Power 2: Pb	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MW	0.1 / 0.00001	
414	Power 2: Pc	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MW	0.1 / 0.00001	
415	Power 2: Qa	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVAr	0.1 / 0.00001	
416	Power 2: Qb	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVAr	0.1 / 0.00001	
417	Power 2: Qc	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVAr	0.1 / 0.00001	
418	Power 2: Sa	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVA	0.1 / 0.00001	
419	Power 2: Sb	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVA	0.1 / 0.00001	
420	Power 2: Sc	2	0	Configurable	0.1 / (0.00001 – 1.0)	0.0	MVA	0.1 / 0.00001	
421	Power 2: PFa	2	-1000.0	1000.0	0.01 / (0.001 – 1.0)	0.0	N/A	0.01/ 0.001	
422	Power 2: PFb	2	-1000.0	1000.0	0.01 / (0.001 – 1.0)	0.0	N/A	0.01/ 0.001	
423	Power 2: PFc	2	-1000.0	1000.0	0.01 / (0.001 – 1.0)	0.0	N/A	0.01/ 0.001	

a. The minimum and maximum transmitted values are the lowest and highest values that the outstation will report in DNP analog input objects. These values are integers if the outstation transmits only integers. If the outstation is capable of transmitting both integers and floating-point, then integer and floating-point values are required for the minimums and maximums.
For example, a pressure sensor is able to measure 0 to 500 kPa. The outstation provides a linear conversion of the sensor's output signal to integers in the range of 0 to 25000 or floating-point values of 0 to 500.000. The sensor and outstation are used in an application where the maximum possible pressure is 380 kPa. For this input, the minimum transmitted value would be stated as 0 / 0.0 and the maximum transmitted value would be stated as 19000 / 380.000.

b. The scaling information for each point specifies how data transmitted in integer variations (16 bit and 32 bit) is converted to engineering units when received by the Master (i.e. scaled according to the equation: scaled value = multiplier * raw + offset). Scaling is not applied to Floating point variations since they are already transmitted in engineering units.

c. Resolution is the smallest change that may be detected in the value due to quantization errors and is given in the units shown in the previous column. This parameter does not represent the accuracy of the measurement.

d. Maximal values are calculated as (2 * Configured Nominal / Multiplier) for voltage channels and as (40 * Configured Nominal / Multiplier) for current channels (see Note 2 above for the nominal definitions).

2.4 Octet String Points Static (Steady-State) Group Number: 110 Event Group Number: 111	**Capabilities**	**Current Value**	**If configurable, list methods**
2.4.1 Event reporting mode *:	☐ Only most recent ☒ All events		
2.4.2 Octet Strings Included in Class 0 response:	☐ Always ☒ Never ☐ Only if point is assigned to Class 1, 2, or 3 ☐ Based on point Index (add column to table below)		
2.4.3 Definition of Octet String Point List:	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☒ Other, explain Used for Event Log access as described below		

* Object 110 and 111 are Octet String Object used to provide access to the Event Log text of the relay. Object 110 always contains the most recent event in the relay. Object 111 is the corresponding change event object.

As stated in the DNP specifications, the variation of the response object represents the length of the string. The string represents the ASCII values of the event text.

Implementation Table

The following implementation table identifies which object groups and variations, function codes and qualifiers the device supports in both requests and responses. The Request columns identify all requests that may be sent by a Master, or all requests that must be parsed by an Outstation. The Response columns identify all responses that must be parsed by a Master, or all responses that may be sent by an Outstation.

NOTES	
NOTES	The implementation table must list all functionality required by the device whether Master or Outstation as defined within the DNP3 IED Conformance Test Procedures. Any functionality beyond the highest subset level supported is indicated by highlighted rows. Any Object Groups not provided by an outstation or not processed by a Master are indicated by strikethrough (note these Object Groups will still be parsed).

DNP Object Group & Variation			Request Outstation parses		Response Outstation can issue	
Group Num	**Var Num**	**Description**	**Function Codes (dec)**	**Qualifier Codes (hex)**	**Function Codes (dec)**	**Qualifier Codes (hex)**
1	0	Binary Input - Any Variation	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
1	1	Binary Input - Packed format	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
1	2	Binary Input - With flags	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
2	0	Binary Input Event - Any Variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response)	17, 28 (index)
2	1	Binary Input Event - Without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) ~~130 (unsol. resp)~~	17, 28 (index)
2	2	Binary Input Event - With absolute time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) ~~130 (unsol. resp)~~	17, 28 (index)
2	3	Binary Input Event - With relative time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) ~~130 (unsol. resp)~~	17, 28 (index)
10	0	Binary Output - Any Variation	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
10	2	Binary Output - Output Status with flag	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
12	1	Binary Command - Control relay output block (CROB)	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, no ack)	17, 28 (index)	129 (response)	Echo of request

DNP Object Group & Variation			Request Outstation parses		Response Outstation can issue	
Group Num	**Var Num**	**Description**	**Function Codes (dec)**	**Qualifier Codes (hex)**	**Function Codes (dec)**	**Qualifier Codes (hex)**
20	0	~~Counter - Any Variation~~	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. noack)	06 (no range, or all)	129 (response)	
20	1	~~Counter - 32 bit with flag~~			129 (response)	~~00, 01 (start-stop)~~
20	2	~~Counter - 16 bit with flag~~			129 (response)	~~00, 01 (start-stop)~~
20	5	~~Counter - 32 bit without flag~~			129 (response)	~~00, 01 (start-stop)~~
20	6	~~Counter - 16 bit without flag~~			129 (response)	~~00, 01 (start-stop)~~
21	0	~~Frozen Counter - Any Variation~~	1 (read)	06 (no range, or all)		
21	1	~~Frozen Counter - 32 bit with flag~~			129 (response)	~~00, 01 (start-stop)~~
21	2	~~Frozen Counter - 16 bit with flag~~			129 (response)	~~00, 01 (start-stop)~~
21	9	~~Frozen Counter - 32 bit without flag~~			129 (response)	~~00, 01 (start-stop)~~
21	10	~~Frozen Counter - 16 bit without flag~~			129 (response)	~~00, 01 (start-stop)~~
22	0	~~Counter Event - Any Variation~~	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
22	1	~~Counter Event - 32 bit with flag~~			129 (response) ~~130 (unsol. resp)~~	~~17, 28 (index)~~
22	2	~~Counter Event - 16 bit with flag~~			129 (response) ~~130 (unsol. resp)~~	~~17, 28 (index)~~
30	0	Analog Input - Any Variation	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
30	1	Analog Input - 32-bit with flag	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
30	2	Analog Input - 16-bit with flag	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
30	3	Analog Input - 32-bit without flag	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop)
30	4	Analog Input - 16-bit without flag	1 (read)	06 (no range, or all) 00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	
32	0	Analog Input Event - Any Variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response)	17, 28 (index)
32	1	Analog Input Event - 32-bit without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) ~~130 (unsol. resp)~~	17, 28 (index)
32	2	Analog Input Event - 16-bit without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) ~~130 (unsol. resp)~~	17, 28 (index)
32	3	Analog Input Event - 32-bit with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response)	17, 28 (index)
32	4	Analog Input Event - 16-bit with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response)	17, 28 (index)
40	0	~~Analog Output Status - Any Variation~~	1 (read)	06 (no range, or all)	129 (response)	

DNP Object Group & Variation			Request Outstation parses		Response Outstation can issue	
Group Num	Var Num	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
40	2	~~Analog Output Status - 16-bit with flag~~			129 (response)	~~00, 01 (start-stop)~~
41	2	~~Analog Output - 16-bit~~	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, no ack)	17, 28 (index)	129 (response)	~~Echo of request~~
50	1	~~Time and Date - Absolute time~~	2 (write)	07 (limited qty = 1)	129 (response)	
51	1	~~Time and Date CTO - Absolute time, synchronized~~			~~129 (response)~~ ~~130 (unsol. resp)~~	~~07 (limited qty)~~ ~~(qty = 1)~~
51	2	Time and Date CTO - Absolute time, unsynchronized			129 (response) ~~130 (unsol. resp)~~	07 (limited qty) (qty = 1)
52	1	Time Delay - Coarse			129 (response)	07 (limited qty) (qty = 1)
52	2	~~Time delay - Fine~~			~~129 (response)~~	~~07 (limited qty)~~ ~~(qty = 1)~~
60	1	Class Objects - Class 0 data	1 (read)	06 (no range, or all)	129 (response)	00, 01 (start-stop)
60	2	Class Objects - Class 1 data	1 (read)	06 (no range, or all)	129 (response)	17, 28 (index)
60	3	Class Objects - Class 2 data	1 (read)	06 (no range, or all)	129 (response)	17, 28 (index)
60	4	Class Objects - Class 3 data	1 (read)	06 (no range, or all)	129 (response)	17, 28 (index)
80	1	Internal Indications - Packet format	2 (write)	00 (start-stop) (index = 7)	129 (response)	
110	0	Octet string	1 (read)	06 (no range, or all)	129 (response)	07 (limited qty)
111	0	Octet string event	1 (read)	06 (no range, or all)	129 (response)	07 (limited qty)
No Object (function code only)			13 (cold restart)		129 (response)	
No Object (function code only)			14 (warm restart)		129 (response)	
No Object (function code only)			23 (delay meas.)		129 (response)	

Appendix G. Mechanical Drawings

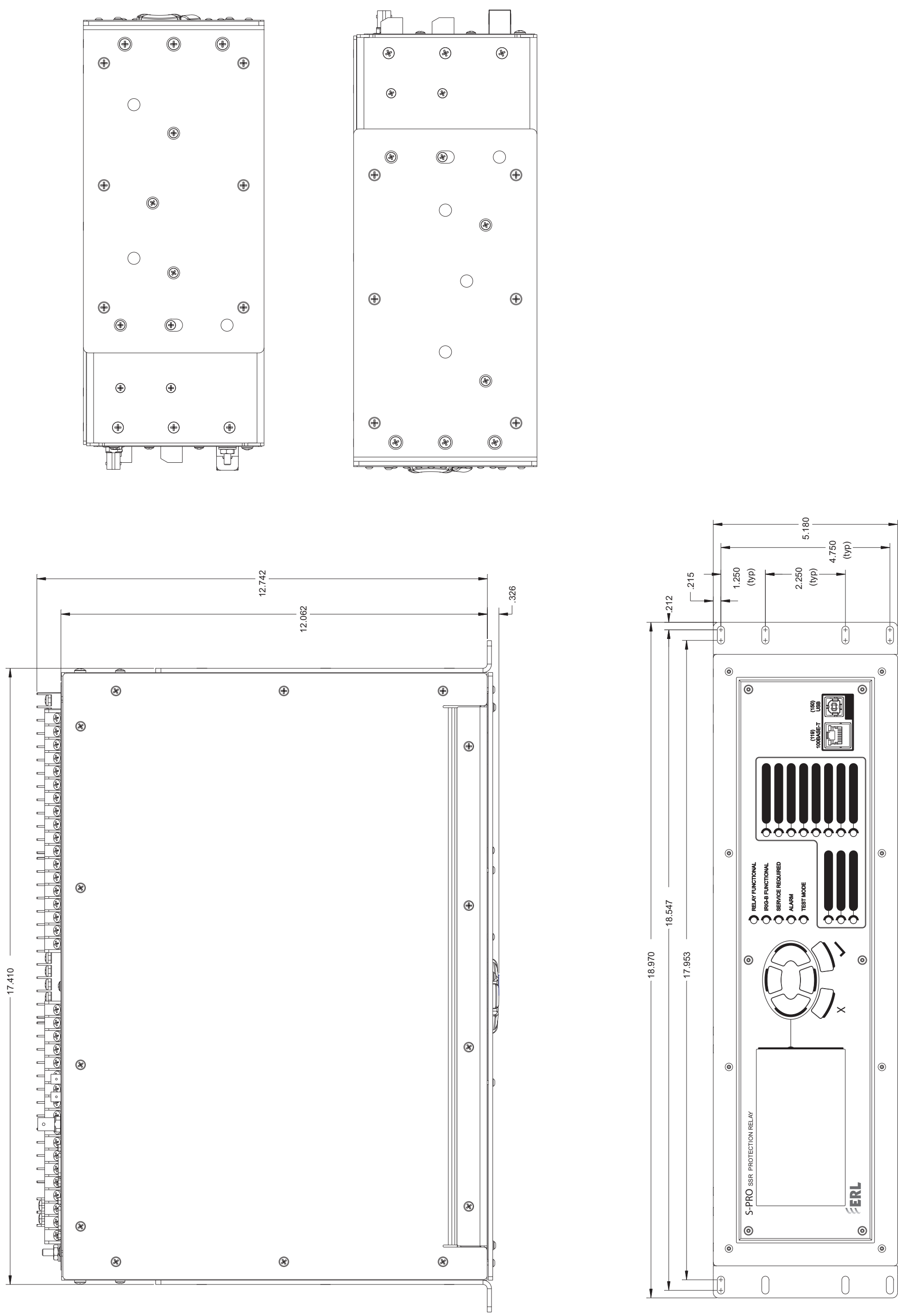


Figure G.1: Mechanical Drawing (3U)

Appendix H Rear Panel Drawings

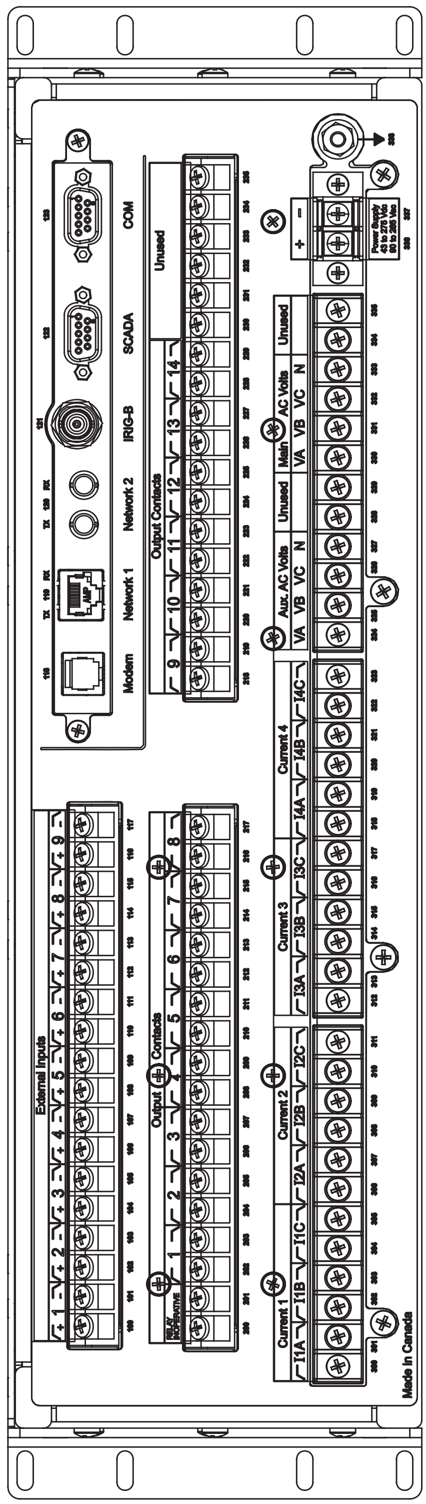


Figure H.1: Rear Panel – 3U Chassis

Appendix I AC Schematic Drawings

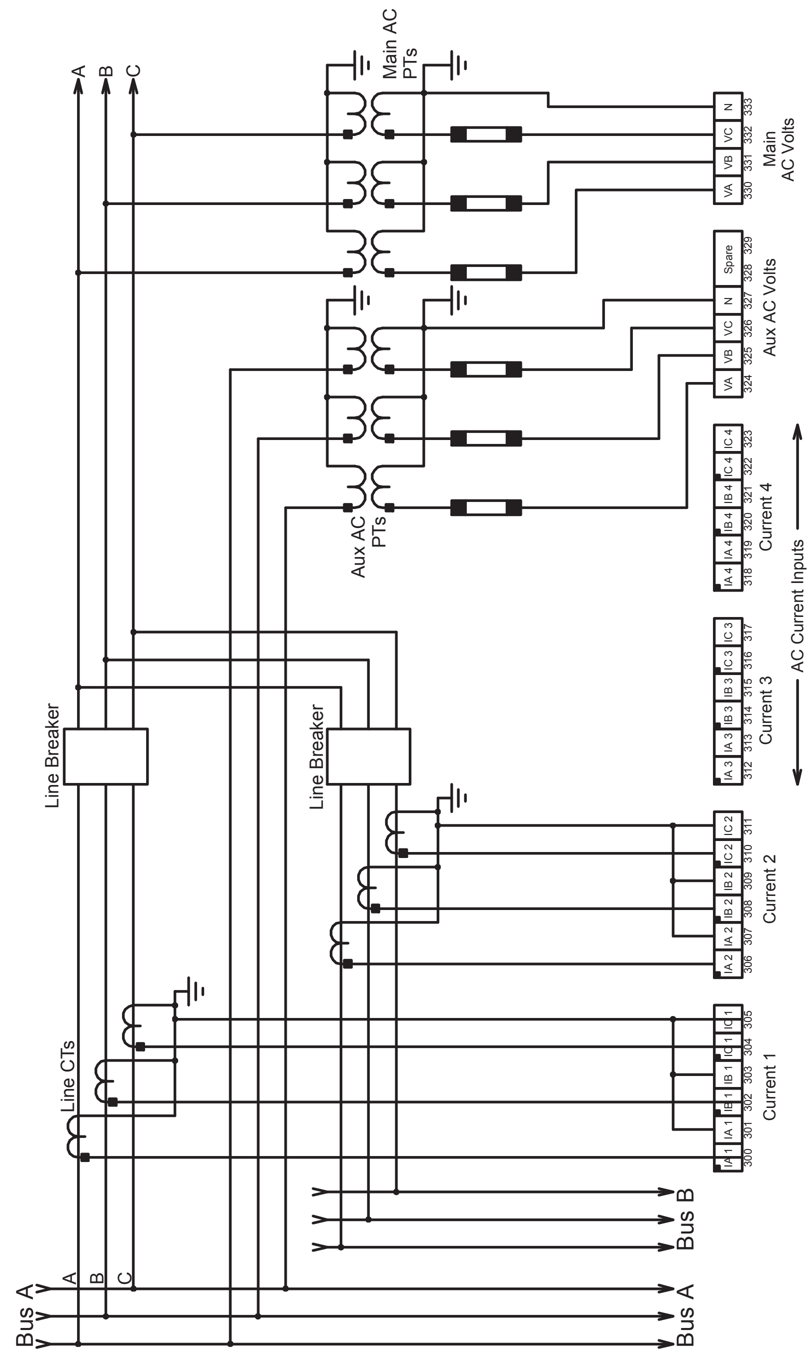
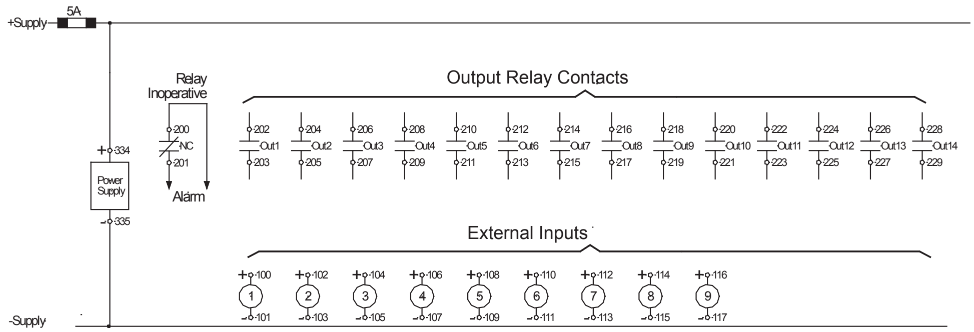


Figure I.1: S-PRO AC Schematic

Appendix J DC Schematic Drawings



Notes:
1. IRIG-B and comm ports shown separately on S-PRO rear panel layout drawing.
2. All output relays can be programmed to operate on any relay function.
3. All outputs are rated tripping duty, interrupting via breaker aux "a" contact

Figure J.1: S-PRO DC Schematic

Appendix K Function Logic Diagram

Diagram in plastic sleeve.

Appendix L S-PRO Setting Example

Protection, Timers and I/O Status

The relay does not block any protection functions or external inputs during the setting save or active group change, but the external output contacts are reset for one cycle.

The relay applies the setting parameters, resets all protection functions, resets all timers and continues to process the protection algorithms but does not apply any action to the output contacts for one cycle. For close-in (heavy) fault conditions that occur at the time of a setting change the relay performance has a maximum increase in output delay of one cycle. For light fault conditions the relay performance does not have a noticeable change. There is normally a one cycle decision making process of operating time. When the relay algorithms determine that a fault is present, tripping will occur after a one cycle delay. It will take an additional 3 ms to actually close the output tripping contacts.

Latch Status

The relay does not reset any ProLogic, Group Logic or Virtual Input latch functions during the setting save or active group change. Retaining latch status allows the relay continuous access to specific latched logic states. This is useful when the relay has ProLogic, Group Logic or Virtual Input functions used to block protection or ancillary functions for specific operating conditions.

Event Status Reset

The relay resets all the events that are currently high and reports states of all the events that remain high after a setting change.

Viewing Active Setting Group

To view the active setting group and status of the group logic functions in real time via the TUI, enter the *Metering/Logic/Setting Group* menu choice. To view a snapshot of the group logic data, enter the *Settings/Active Group* menu choice.

Front Panel Active Setting Group

The front panel display along with the front panel control buttons allow the user to access metering and setting functions within the relay.

The front display also allows the user to reset the LED target lights that will occur if a relay trip occurs. The front display will go dark and reset if no user interaction has taken place for a period of time. Pressing any of the front panel control buttons brings the front panel to life.

L.1 Switching Setting Groups

The user can program a total of 16 Group Logic statements per setting group to cause a setting change from one group to another. Create settings using the *Offliner* setting software or by using the Terminal Mode.

Some common uses for setting groups might be cold load pickup, Zone 1 and/ or Zone 2 reach extension for phase and ground distance elements, zero sequence source increase or decrease.

An example of pulsing an external input and an example of a solid initiate to activate setting group changes are shown below.

Using One External Input to Toggle Setting Group

Use one external input connected to a SCADA output contact to toggle between 2 or more setting groups. In this example we connect external input one (EI 1) to the SCADA control output contact and switch between group 1 and group 2. If the user wanted to switch through all setting groups, group logic 2 would switch to setting group 3, and so forth. If the contact input to switch setting groups becomes welded shut or the SCADA system has a problem, the relay will only switch to the new logic and stay in that logic until the input has been de-energized for the ProLogic pickup delay, which was set to 10 seconds.

Setting Group 1 – Logic Statements

When setting group one becomes active either through a setting group change or is the default group after relay power up, ProLogic 9 becomes high after the 10.00 second delay, if EI 1 is low. ProLogic 9 is set for a 0.26 second dropout time; to be used with ProLogic 10 dropout timer allowing for the slower processing thread where Group Logic is processed and providing a definite timed pulse to the group logic.

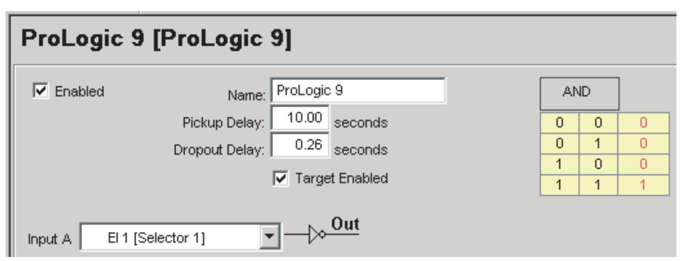


Figure L.1: ProLogic 9

Prologic 10 has no intentional delay and becomes high for the combined drop-out time of ProLogic 9 and 10 equalling 0.52 seconds.

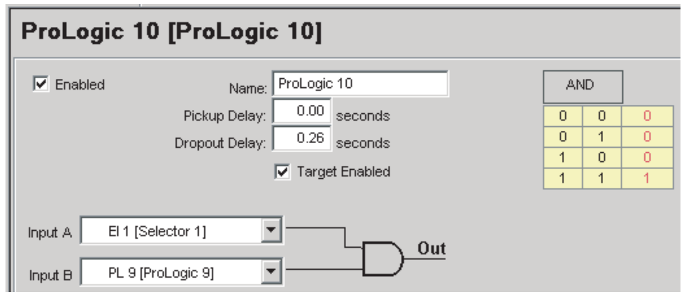


Figure L.2: ProLogic 10

Group Logic 1 is used to switch to the new setting group; there is no intentional delay. The user can also provide 4 additional logic inputs to be used to provide qualifiers before switching setting groups. The example uses a ProLogic statement and an external input as qualifiers, see example “” in Appendix L’ on page Appendix L-8.

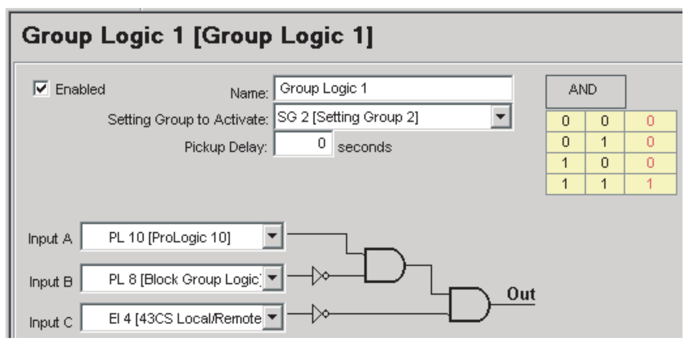


Figure L.3: Group Logic 1

Setting Group 2 – Logic Statements

When setting group 2 becomes active either through a setting group change or is the default group after relay power up, ProLogic 9 becomes high after the 10.00 second delay, if external input one is low. The example shows ProLogic 9 set for a 0.26 second dropout time to be used with ProLogic 10 dropout timer allowing for the slower processing thread where Group Logic is processed and providing a definite timed pulse to the group logic.

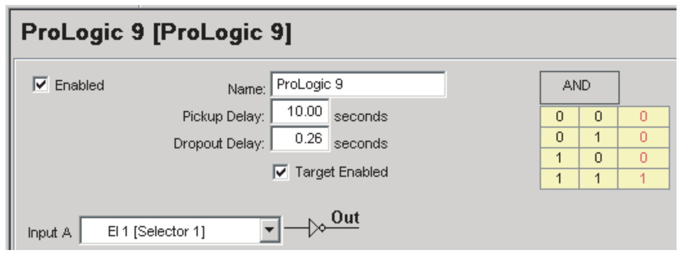


Figure L.4: ProLogic 9

Prologic 10 has no intentional delay and becomes high for the combined drop-out time of ProLogic 9 and 10 equalling 0.52 seconds.

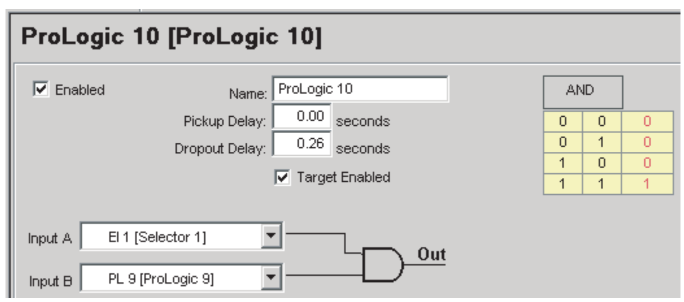


Figure L.5: ProLogic 10

Group Logic 1 is used to switch to the new setting group; there is no intentional delay.

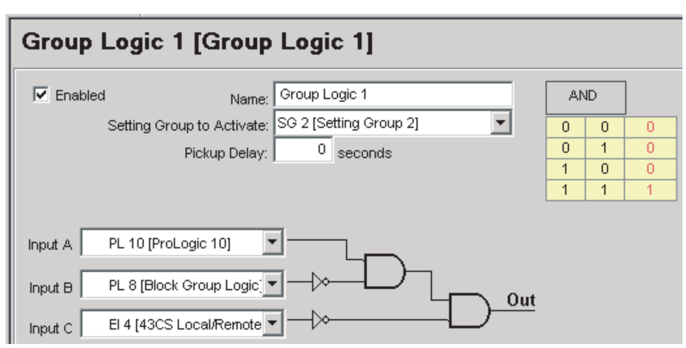


Figure L.6: Group Logic 1

Using Three External Inputs to Toggle Setting Group

Three external inputs connected to an 8 position selector switch. The output contact is used to build a truth table to toggle between 8 setting groups. In this example we connect EI 1, EI 2, and EI 3 to the selector switch output contacts.

Selector Switch	Input States			Setting Group to Activate
	EI 3	EI 2	EI 1	
1	0	0	0	Setting Group 1
2	0	0	1	Setting Group 2
3	0	1	0	Setting Group 3
4	0	1	1	Setting Group 4
5	1	0	0	Setting Group 5
6	1	0	1	Setting Group 6
7	1	1	0	Setting Group 7
8	1	1	1	Setting Group 8

Setting Group 1…8 – Logic Statements

The following Group Logic statements are entered into each of the 8 setting groups.

When the selector switch is rotated to the appropriate position the corresponding setting group becomes active. Each setting group logic can have a specific time delay pickup setting. The user can also provide 2 additional logic inputs in each statement to be used to provide qualifiers before switching setting groups. We are using a ProLogic statement and an external input as qualifiers, see “” in Appendix L’ on page Appendix L-8.

EI 1 low, EI 2 low, and EI 3 low

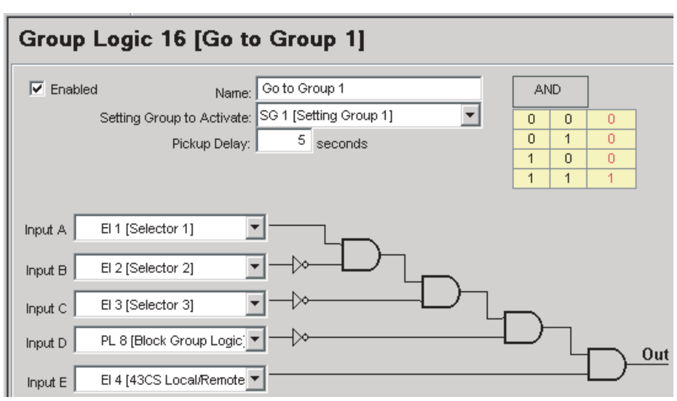


Figure L.7: Group Logic 16

EI 1 high, EI 2 low, and EI 3 low

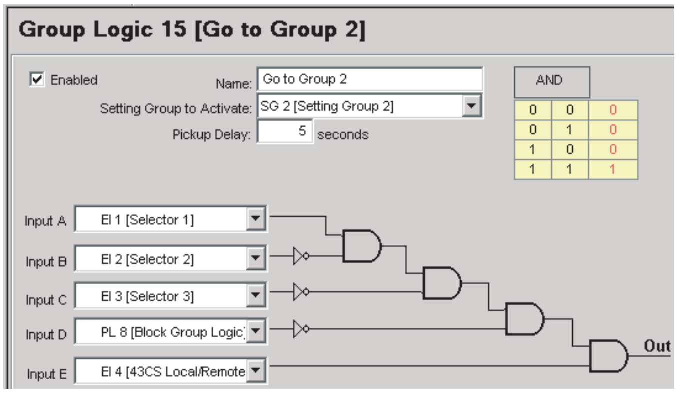


Figure L.8: Group Logic 15

EI 1 low, EI 2 high, and EI 3 low

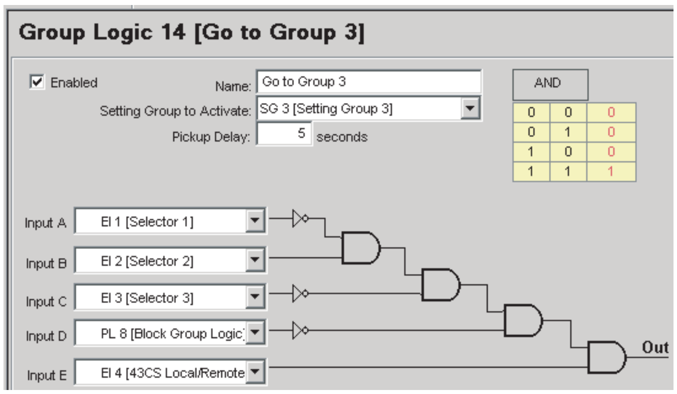


Figure L.9: Group Logic 14

EI 1 high, EI 2 high, and EI 3 low

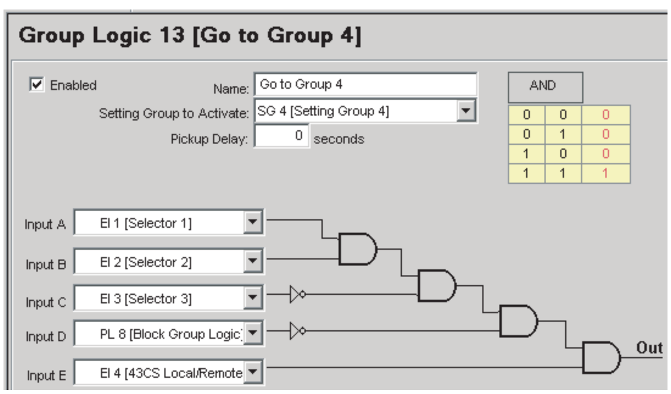


Figure L.10: Group Logic 13

EI 1 low, EI 2 low, and EI 3 high

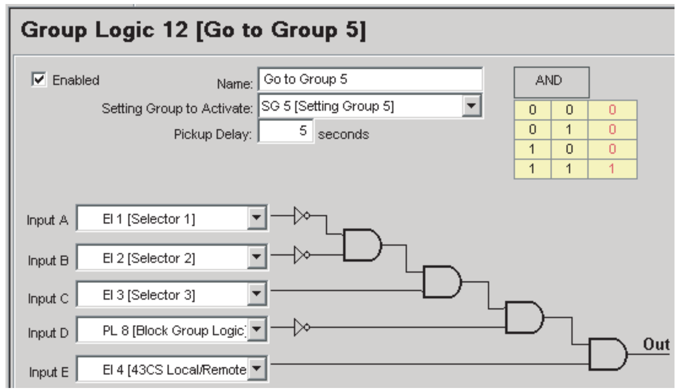


Figure L.11: Group Logic 12

EI 1 high, EI 2 low, and EI 3 high

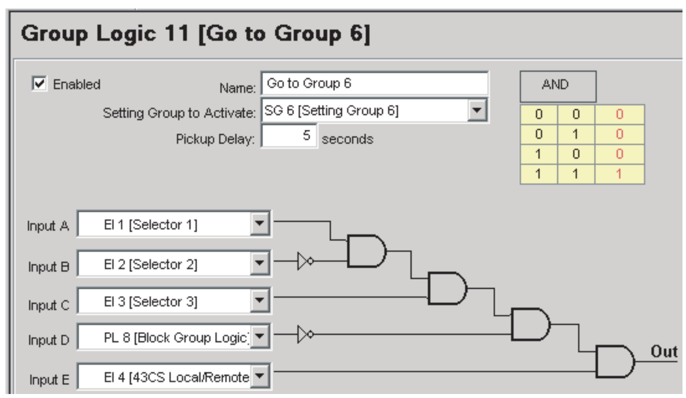


Figure L.12: Group Logic 11

EI 1 low, EI 2 high, and EI 3 high

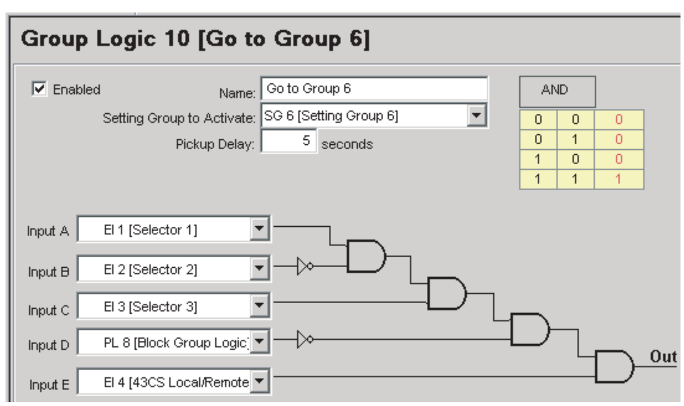


Figure L.13: Group Logic 10

EI 1 high, EI 2 high, and EI 3 high

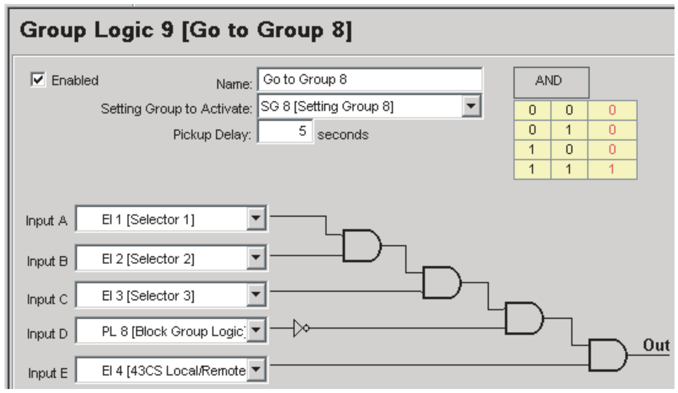
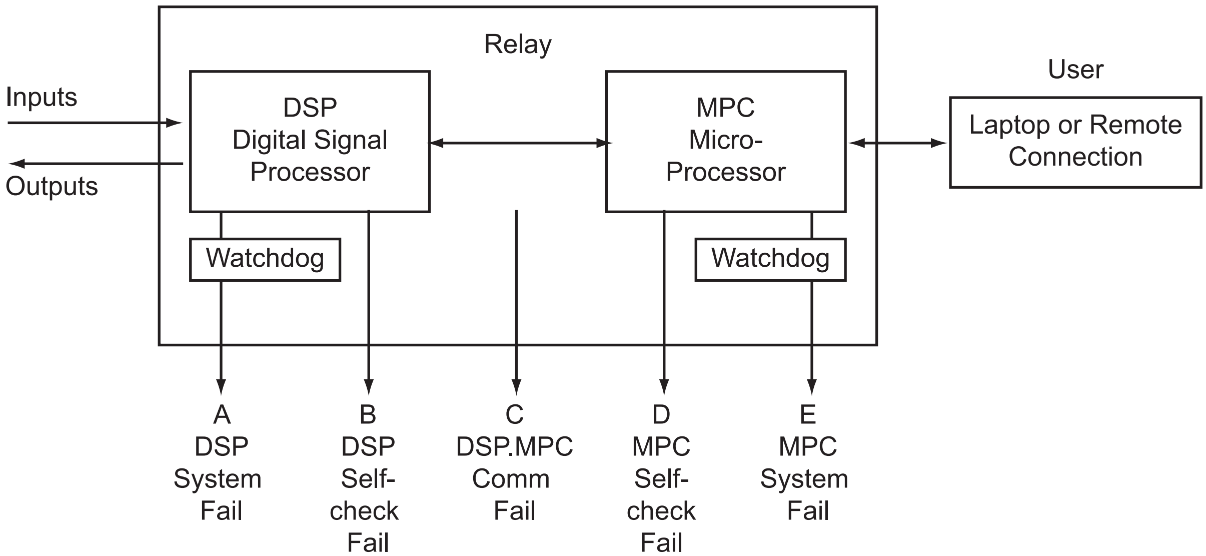


Figure L.14: Group Logic 9

Appendix M Failure Modes



M.1 Actions

A - DSP System Failure

The Relay Functional LED changes from green to off. The Master Relay is de-energized. Two of its contacts open, disconnecting power to the other auxiliary relays. A separate contact labeled "Relay Inoperative" on the rear panel closes to activate a remote alarm.

The watch-dog repeatedly attempts to re-start the DSP for diagnostic purposes. The Relay Functional LED stays off and the relays remain de-energized, even for a successful re-start. Only a power-down/power-up cycle will reset the LED to green and re-energize the relays.

B – DSP Self-Check Fail

The Self Check Fail output can be assigned and used in ProLogic statements and the Output Matrix.

The Relay Functional LED changes from green to off. The Master Relay is de-energized. Two of its contacts open, disconnecting power to the other auxiliary relays. A separate contact labeled "Relay Inoperative" on the rear panel closes to activate a remote alarm.

For B - If Self Check Fail: Block occurs, the Relay Functional LED changes from green to off. The Master Relay is de-energized. Two of its contacts open, disconnecting power to the other auxiliary relays. A separate contact labeled "Relay Inoperative" on the rear panel closes to activate a remote alarm.

There are two possibilities for DSP Self Check Fail, either Alarm or Block. Both are related to the dc offset on a channel which should not occur with prop-

er calibration. Alarm just drives the optional output contact but Block causes the Relay Functional LED to go out and the relay to be unable to drive any output contact.

C – DSP- Micro Processor (MPC) Comm Failure, or D - MPC Self-Check Fail

The Service Required LED changes from off to red.

E – MPC System Fail

The Test Mode LED changes from off to red until the MPC has rebooted. The watchdog will continue to attempt to re-start the MPC several times. After multiple failed attempts, the Service Required LED changes from off to red.

Appendix N. IEC61850 Implementation

N.1 Protocol Implementation Conformance Statement (PICS)

Introduction

This specification is the Protocol Implementation Conformance Statement (PICS) and presents the ACSI conformance statements as defined in Annex A of Part 7-2 of the IEC 61850 standard specifications.

ACSI basic conformance statement

The basic conformance statement shall be as defined in Table N.1.

Table N.1: Basic Conformance Statement

		Server/Publisher	Remarks
Client-Server Roles			
B11	**Server** Side (of two-party-application-association)	c1	YES
B12	**Client** Side (of two-party-application-association)		NO
SCSMs supported			
B21	**SCSM**: IEC 61850-8-1 used		YES
B22	**SCSM**: IEC 61850-9-1 used		NO
B23	**SCSM**: IEC 61850-9-2 used		NO
B24	**SCSM** other		NO
Generic Substation event Model (GSE)			
B31	**Publisher** side	O	YES
B32	**Subscriber** side		YES
Transmission of Sampled value model (SVC)			
B41	**Publisher** side	O	NO
B42	-	O	NO

c1 – Shall be ‘M’ if support for Logical-device model has been
O – Optional
M – Mandatory

ACSI Models Conformance Statement

The ASCI models conformance statement shall be as defined in Table N.2.

Table N.2: ACSI Models Conformance Statement			
		Server/Publisher	**Remarks**
M1	Logical Device	c2	YES
M2	Logical Node	c3	YES
M3	Data	c4	YES
M4	Data set	c5	YES
M5	Substitution	O	NO
M6	Setting group control	O	NO
Reporting			
M7	Buffered report control	O	YES
M7-1	Sequence - number		YES
M7-2	Report-time-stamp		YES
M7-3	Reason-for-inclusion		YES
M7-4	Data-set-name		YES
M7-5	Data-reference		YES
M7-6	Buffer-overflow		YES
M7-7	Entry id		YES
M7-8	BufTm		YES
M7-9	IntgPd		YES
M7-10	GI		YES
M8	Unbuffered report control	O	NO
M8-1	Sequence - number		NO
M8-2	Report-time-stamp		NO
M8-3	Reason-for-inclusion		NO
M8-4	Data-set-name		NO
M8-5	Data-reference		NO
M8-6	IntgPd		NO
M8-7	GI		NO
	Logging	O	NO
M9	Log control	O	NO

ACSI Models Conformance Statement (continued)			
M9-1	IntgPd		NO
M10	Log	O	NO
M11	Control	M	YES
If GSE(B31/B32) is supported			
M12	GOOSE	O	YES
M12-1	EntryID	M	YES
M12-2	DataRefInc	M	YES
M13	GSSE	O	NO
If SVC(B41/B42) is supported			
M14	Multicast SVC	O	NO
M16	Time	M	YES
M17	File Transfer	O	NO
c2 – shall be ‘M’ if support for LOGICAL-NODE model has been declared c3 – shall be ‘M’ if support for DATA model has been declared c4 – shall be ‘M’ if support for DATA-SET, Substitution, Report, Log Control or Time model has been declared c5 – shall be ‘M’ if support for Report, GSE or SV model has been declared M – Mandatory			

ACSI Service Conformance Statement

The ASCI service conformance statement shall be as defined in Table N.3 through Table N.17.

Table N.3: ACSI Service Conformance Statement

	Services	AA: TP/MC	Server/Publisher	Remarks
Server (Clause 6)				
S1	ServerDirectory	TP	M	YES

Table N.4: Application association (Clause 7)				
S2	Associate		M	YES
S3	Abort		M	YES
S4	Release		M	YES

Table N.5: Logical Device (Clause 8)				
S5	Logical Device Directory	TP	M	YES

Table N.6: Logical Node (Clause 9)				
S6	LogicalNodeDirectory	TP	M	YES
S7	GetAllDataValues	TP	M	YES

Table N.7: Data (Clause 10)				
S8	GetDataValues	TP	M	YES
S9	SetDataValues	TP	O	NO
S10	GetDataDirectory	TP	M	YES
S11	GetDataDefinition	TP	M	YES

Table N.8: Data Set (Clause 11)				
S12	GetDataSetValues	TP	M	YES
S13	SetDataSetValues	TP	O	NO
S14	CreateDataSet	TP	O	NO
S15	DeleteDataSet	TP	O	NO
S16	GetDataSetDirectory	TP	O	YES

Table N.9: Substitution (Clause 12)				
S17	SetDataValues	TP	M	NO

Table N.10: Setting Group control (Clause 13)				
S18	SelectActiveSG	TP	O	NO
S19	SelectEditSG	TP	O	NO
S20	SetSGValues	TP	O	NO
S21	ConfirmEditSGValues	TP	O	NO
S22	GetSGValues	TP	O	NO
S23	GetSGCBValues	TP	O	NO

Table N.11: Reporting (Clause 14)				
BUFFERED-REPORT-CONTROL-BLOCK (BRCB)				
S24	Report	TP	c6	YES
S24-1	Data-change (dchg)			YES
S24-2	qchg-change (qchg)			NO
S24-3	Data-update (dupd)			NO
S25	GetBRCBValues	TP	c6	YES
S26	SetBRCBValues	TP	c6	YES
UNBUFFERED-REPORT-CONTROL-BLOCK (URCB)				
S27	Report	TP	c6	YES
S27-1	Data-change (dchg)			YES
S27-2	qchg-change (qchg)			NO
S27-3	Data-update (dupd)			NO
S28	GetURCBValues	TP	c6	YES
S29	SetURCBValues	TP	c6	YES
c6 – shall declare support for at least one (BRCB or URCB)				

Table N.12: Logging (Clause 14)				
LOG-CONTROL-BLOCK (BRCB)				
S30	GetLCBValues	TP	M	NO
S31	SetLCBValues	TP	M	NO
Log				
S32	QueryLogByTime	TP	M	NO
S33	QueryLogAfter	TP	M	NO
S34	GetLogStatusValues	TP	M	NO
c7- shall declare support for at least one(query log by time or Query LogAfter)				

Table N.13: Generic Substation Event Model (GSE) (Clause 15)				
GOOSE-CONTROL-BLOCK				
S35	SendGOOSEMessage	MC	c8	YES
S36	GetGoReference	TP	c9	NO
S37	GetGOOSEElementNumber	TP	c9	NO
S38	GetGoCBValues	TP	O	YES
S39	SetGoCBValues	TP	O	YES
GSSE-CONTROL-BLOCK				
S40	SendGSSEMessage	MC	c8	YES
S41	GetGsReference	TP	c9	NO
S42	GetGSSEElementNumber	TP	c9	NO
S43	GetGsCBValues	TP	O	YES
S44	SetGsCBValues	TP	O	YES
c8- shall declare support for at least one(Send GOOSE Message or Send GSSE Message) c9- shall declare support if TP association is available				

Table N.14: Transmission of Sample Value Model (SVC) (Clause 16)				
Multicast SVC				
S45	SendMSVMessage	MC	c10	NO
S46	GetMSVCBMessage	TP	O	NO
S47	SetMSVCBMessage	TP	O	NO
Unicast SVC				
S48	SendUSVMessage	MC	c10	NO
S49	GetMUVCBMessage	TP	O	NO
S50	SetMUVCBMessage	TP	O	NO
c10- shall declare support for at least one(Send MSV Message or Send USV Message)				

Table N.15: Control (Clause 17)				
Multicast SVC				
S51	Select	TP	O	NO
S52	SelectWithValue	TP	O	NO
S53	Cancel	TP	O	NO
S54	Operate	TP	O	NO
S55	CommandTermination	TP	O	NO
S56	TimeActivatedOperate	TP	O	NO

Table N.16: File transfer (Clause 20)				
S57	Select	TP	M	NO
S58	SetFile	TP	O	NO
S59	DeleteFile	TP	O	NO
S60	GetFileAttributeValues	TP	M	NO

Table N.17: Time (Clause 5.5)			
T1	Time Resolution of Internal Clock	10 (1msec)	Nearest negative power of 2 in seconds
T2	Time Accuracy of Internal Clock	10 (1msec)	T0
			T1
			T2
			T3
			T4
			T5
T3	Supported Time Stamp Resolution	16 (25 μs)	Nearest value of 2**-n in seconds according to 5.5.3.7.3.3

N.2 Model Implementation Conformance Statement (MISC)

Introduction

This specification is the Model Implementation Conformance Statement (MICS) and presents the top-level IEC 61850 data model that has been implemented. The definitions of all used Logical Nodes and their associated Common Data Classes, components and associated enumerated values are also included for completeness.

The reader is expected to be conversant with the terminology presented within the IEC 61850 part 7 series of specifications.

Objective

To provide comprehensive details of the standard data object model elements supported by the device. The MICS is conformant to the devices associated ICD (Substation Configuration Language) file, according to part 6 of the IEC 61850 standards. The layout of the presented tables within this document is conformant to the part 7 series of the IEC 61850 standard specifications with the following exceptions:

- The “Trigger Options” field is not presented
- The “M/O” field is not present as the definitions are as deployed within the model
- An additional column “X” is used to signify custom attributes

Logical Device Definitions

This IEC 61850 server device contains one Logical Device. Logical Device contains a data model built from instances of specific Logical Nodes and must consist of at least an instance of the LPHD Logical Node (which is responsible for providing physical device information) and an instance of the LLN0 Logical Node (for addressing common issues across the Logical Device). The IEC 61850 data model is contained within the Logical Devices detailed in the Table N.18. All LNs are categorized according to this table to ensure that data model variables in them have respective scope of data information.

Table N.18: Table N.18 Logical Device Definitions

Logical Device	Description
Protection	Protection Domain
Measurements	Measurements Domain
FaultData	Fault Data Domain
System	System Domain

IEC 61850 Logical Devices Data Model

The IEC 61850 Logical Device top-level data model consists of instances of Logical Nodes. The data model name for a Logical Node instance is constructed from an optional prefix (known as the wrapper), the Logical Node name, and an instance ID (or suffix).

Table N.19: Logical Devices Data Model

LN Instance	LN Type	Description
Protection LD		
LLN0	LLN02	Logical node zero
LPHD1	LPHD3	Physical device information
D27MnPTUV1	PTUV1	Undervoltage
D27AuxPTUV2	PTUV1	Undervoltage
D59MnPTOV1	PTOV1	Overvoltage
D59MnPTOV2	PTOV1	Overvoltage
D59AuxPTOV3	PTOV1	Overvoltage
D59AuxPTOV4	PTOV1	Overvoltage
D50LSPIOC1	PIOC1	Instantaneous overcurrent
D50LSPIOC2	PIOC1	Instantaneous overcurrent
D50LSPIOC3	PIOC1	Instantaneous overcurrent
D50LSPIOC4	PIOC1	Instantaneous overcurrent
D50LSPIOC5	PIOC1	Instantaneous overcurrent
D50LSPIOC6	PIOC1	Instantaneous overcurrent
D50LSPIOC7	PIOC1	Instantaneous overcurrent
D50LSPIOC8	PIOC1	Instantaneous overcurrent
Main1PSHD1	PSHD1	Subharmonic disturbance
Main2PSHD2	PSHD1	Subharmonic disturbance
Aux1PSHD3	PSHD1	Subharmonic disturbance
Aux2PSHD4	PSHD1	Subharmonic disturbance
I1D1PSHD5	PSHD1	Subharmonic disturbance
I1D2PSHD6	PSHD1	Subharmonic disturbance
I2D1PSHD7	PSHD1	Subharmonic disturbance
I2D2PSHD8	PSHD1	Subharmonic disturbance
I3D1PSHD9	PSHD1	Subharmonic disturbance

I3D2PSHD10	PSHD1	Subharmonic disturbance
I4D1PSHD11	PSHD1	Subharmonic disturbance
I4D2PSHD12	PSHD1	Subharmonic disturbance
S1D1PSHD13	PSHD1	Subharmonic disturbance
S1D2PSHD14	PSHD1	Subharmonic disturbance
S2D1PSHD15	PSHD1	Subharmonic disturbance
S2D2PSHD16	PSHD1	Subharmonic disturbance
S3D1PSHD17	PSHD1	Subharmonic disturbance
S3D2PSHD18	PSHD1	Subharmonic disturbance
S4D1PSHD19	PSHD1	Subharmonic disturbance
S4D2PSHD20	PSHD1	Subharmonic disturbance
Measurements LD		
LLN0	LLN02	Logical node zero
LPHD1	LPHD3	Physical device information
Pwr1MMXU1	MMXU1	Measurement
Pwr2MMXU2	MMXU1	Measurement
MVMMXU3	MMXU3	Measurement
AVMMXU4	MMXU4	Measurement
I1MMXU5	MMXU2	Measurement
I2MMXU6	MMXU2	Measurement
I3MMXU7	MMXU2	Measurement
I4MMXU8	MMXU2	Measurement
Sum1MMXU9	MMXU2	Measurement
Sum2MMXU10	MMXU2	Measurement
Sum3MMXU11	MMXU2	Measurement
Sum4MMXU12	MMXU2	Measurement
MVSHMMXU13	MMXU5	Measurement
AVSHMMXU14	MMXU5	Measurement
I1SHMMXU15	MMXU6	Measurement
I2SHMMXU16	MMXU6	Measurement
I3SHMMXU17	MMXU6	Measurement
I4SHMMXU18	MMXU6	Measurement

S1SHMMXU19	MMXU6	Measurement
S2SHMMXU20	MMXU6	Measurement
S3SHMMXU21	MMXU6	Measurement
S4SHMMXU22	MMXU6	Measurement
FaultData LD		
LLN0	LLN02	Logical node zero
LPHD1	LPHD3	Physical device information
D59M1MMXU1	MMXU4	Measurement
D59M2MMXU2	MMXU4	Measurement
D59A1MMXU3	MMXU4	Measurement
D59A2MMXU4	MMXU4	Measurement
D27MMMXU5	MMXU4	Measurement
D27AMMXU6	MMXU4	Measurement
D50I1MMXU7	MMXU2	Measurement
D50I2MMXU8	MMXU2	Measurement
D50I3MMXU9	MMXU2	Measurement
D50I4MMXU10	MMXU2	Measurement
D50S1MMXU11	MMXU2	Measurement
D50S2MMXU12	MMXU2	Measurement
D50S3MMXU13	MMXU2	Measurement
D50S4MMXU14	MMXU2	Measurement
MSD1MMXU15	MMXU7	Measurement
MSD2MMXU16	MMXU7	Measurement
ASD1MMXU17	MMXU7	Measurement
ASD2MMXU18	MMXU7	Measurement
I1SD1MMXU19	MMXU8	Measurement
I1SD2MMXU20	MMXU8	Measurement
I2SD1MMXU21	MMXU8	Measurement
I2SD2MMXU22	MMXU8	Measurement
I3SD1MMXU23	MMXU8	Measurement
I3SD2MMXU24	MMXU8	Measurement
I4SD1MMXU25	MMXU8	Measurement

I4SD2MMXU26	MMXU8	Measurement
S1SD1MMXU27	MMXU8	Measurement
S1SD2MMXU28	MMXU8	Measurement
S2SD1MMXU29	MMXU8	Measurement
S2SD2MMXU30	MMXU8	Measurement
S3SD1MMXU31	MMXU8	Measurement
S3SD2MMXU32	MMXU8	Measurement
S4SD1MMXU33	MMXU8	Measurement
S4SD2MMXU34	MMXU8	Measurement
VirtualInputs LD		
LLN0	LLN02	Logical node zero
LPHD1	LPHD3	Physical device information
SUBSCRGGIO1	GGIO1	External GOOSE Virtual Inputs
System LD		
LLN0	LLN02	Logical node zero
LPHD1	LPHD3	Physical device information
VIGGIO1	GGIO1	Virtual Inputs status
EIGGIO2	GGIO2	External Inputs status
OCGGIO3	GGIO3	Output Contacts status
PLGGIO4	GGIO4	ProLogic status
SChAlmGGIO5	GGIO5	Self-Check Alarm
TSAlmGGIO6	GGIO5	Time Synchronization Alarm
ComAlmGGIO7	GGIO5	Communication Alarm
LEDGGIO8	GGIO6	LEDs status
SGGGIO9	GGIO7	Active Setting group

Logical Node Definitions

The definition tables for each of the Logical Nodes in the top-level data model are presented in the following sub-sections.

Table N.20 presents a summary of the Logical Node templates used across the Logical Devices within the overall IEC 61850-product data model.

Table N.20: Logical Node Templates

LN Type	LN Class	Namespace
LLN02	LLN0	IEC61850-7-4: 2003
LPHD3	LPHD	IEC61850-7-4: 2003
PTUV1	PTUV	IEC61850-7-4: 2003
PTOV1	PTOV	IEC61850-7-4: 2003
PIOC1	PIOC	IEC61850-7-4: 2003
PSHD1	PSHD	ERL phase custom LN
MMXU1	MMXU	IEC61850-7-4: 2003
MMXU2	MMXU	IEC61850-7-4: 2003
MMXU3	MMXU	IEC61850-7-4: 2003
MMXU4	MMXU	IEC61850-7-4: 2003
MMXU5	MMXU	ERL Phase extension
MMXU6	MMXU	ERL Phase extension
MMXU7	MMXU	ERL Phase extension
MMXU8	MMXU	ERL Phase extension
GGIO1	GGIO	IEC61850-7-4: 2003
GGIO2	GGIO	IEC61850-7-4: 2003
GGIO3	GGIO	IEC61850-7-4: 2003
GGIO4	GGIO	IEC61850-7-4: 2003
GGIO5	GGIO	IEC61850-7-4: 2003
GGIO6	GGIO	IEC61850-7-4: 2003
GGIO7	GGIO	IEC61850-7-4: 2003

Logical Node Type: LPHD3

Description: Physical Device Information

LN Class: LPHD

Attribute	Attr. Type	Description
PhyNam	DPL_1_PhyNam	Physical device name plate
PhyHealth	INS_1_PhyHealth	Physical device health
Proxy	SPS_1_Proxy	Indicates if this LN is proxy

Logical Node Type: LLN02

Description: Logical Node 0

LN Class: LLN0

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
Proxy	SPS_1_Proxy	Indicates if this LN is proxy
NamPlt	LPL_1_NamPlt	Name plate

Logical Node Type: PTUV1

Description: Undervoltage

LN Class: PTUV

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate

Str	ACD_1_Str	Start
Op	ACT_1_Op	Operate

Logical Node Type: PTOV1

Description: Overvoltage

LN Class: PTOV

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
Str	ACD_1_Str	Start
Op	ACT_1_Op	Operate

Logical Node Type: PIOC1

Description: Instantaneous overcurrent.

LN Class: PTOV

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
Proxy	SPS_1_Proxy	Indicates if this LN is proxy
NamPlt	LPL_2_NamPlt	Name plate
Str	ACD_1_Str	Start
Op	ACT_1_Op	Operate

Logical Node Type: PSHD1

Description: Subharmonic disturbance information.

LN Class: PSHD

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
Str	ACD_2_Str	Start
Op	SHA_1_Op	Operate

Logical Node Type: MMXU1

Description: Power Channel 3-phase measurement data.

LN Class: MMXU

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
TotW	MV_1	Total Active Power (Total P)
TotVAr	MV_1	Total Reactive Power (Total Q)
TotVA	MV_1	Total Apparent Power (Total S)
TotPF	MV_1	Average Power factor (Total PF)
W	WYE_1_Mag	Phase active power (P)
VAr	WYE_1_Mag	Phase reactive power (Q)
VA	WYE_1_Mag	Phase apparent power (S)
PF	WYE_1_Mag	Phase power factor

Logical Node Type: MMXU2

Description: Current Channel 3-phase measurement data.

LN Class: MMXU

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
A	WYE_2_Both	Phase currents

Logical Node Type: MMXU3

Description: Voltage Channel 3-phase and fundamental frequency measurement data.

LN Class: MMXU

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
PhV	WYE_2_Both	Phase to ground voltages
Hz	MV_1	Frequency

Logical Node Type: MMXU4

Description: Voltage Channel 3-phase measurement data.

LN Class: MMXU

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode

Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
PhV	WYE_2_Both	Phase to ground voltages

Logical Node Type: MMXU5

Description: Voltage channel 3-phase subharmonic measurement data.

LN Class: MMXU

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
TotSHD	WYE_1_Mag	Total subharmonic distortions
SHDPhV1	WYE_4_SHD	Voltage subharmonic 1st
SHDPhV2	WYE_4_SHD	Voltage subharmonic 2nd
SHDPhV3	WYE_4_SHD	Voltage subharmonic 3rd
SHDPhV4	WYE_4_SHD	Voltage subharmonic 4th
SHDPhV5	WYE_4_SHD	Voltage subharmonic 5th

Logical Node Type: MMXU6

Description: Current channel 3-phase subharmonic measurement data.

LN Class: MMXU

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate

TotSHD	WYE_1_Mag	Total subharmonic distortions
SHDA1	WYE_4_SHD	Current subharmonic 1st
SHDA2	WYE_4_SHD	Current subharmonic 2nd
SHDA3	WYE_4_SHD	Current subharmonic 3rd
SHDA4	WYE_4_SHD	Current subharmonic 4th
SHDA5	WYE_4_SHD	Current subharmonic 5th

Logical Node Type: MMXU7

Description: Voltage channel 3-phase subharmonic fault data.

LN Class: MMXU

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
TotSHD	WYE_1_Mag	Total subharmonic distortions
PhV	WYE_3_SHD	Fundamental voltages
SHDPhV1	WYE_3_SHD	Voltage subharmonic 1st

Logical Node Type: MMXU8

Description: Current channel 3-phase subharmonic fault data.

LN Class: MMXU

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
TotSHD	WYE_1_Mag	Total subharmonic distortions
A	WYE_3_SHD	Fundamental currents

SHDA1	WYE_3_SHD	Current subharmonic 1st

Logical Node Type: GGIO1

Description: 30 General IO binary indicators.

LN Class: GGIO

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
Ind1	SPS_1_Proxy	General indication binary 1
Ind2	SPS_1_Proxy	General indication binary 2
Ind3	SPS_1_Proxy	General indication binary 3
Ind4	SPS_1_Proxy	General indication binary 4
Ind5	SPS_1_Proxy	General indication binary 5
Ind6	SPS_1_Proxy	General indication binary 6
Ind7	SPS_1_Proxy	General indication binary 7
Ind8	SPS_1_Proxy	General indication binary 8
Ind9	SPS_1_Proxy	General indication binary 9
Ind10	SPS_1_Proxy	General indication binary 10
Ind11	SPS_1_Proxy	General indication binary 11
Ind12	SPS_1_Proxy	General indication binary 12
Ind13	SPS_1_Proxy	General indication binary 13
Ind14	SPS_1_Proxy	General indication binary 14
Ind15	SPS_1_Proxy	General indication binary 15
Ind16	SPS_1_Proxy	General indication binary 16
Ind17	SPS_1_Proxy	General indication binary 17
Ind18	SPS_1_Proxy	General indication binary 18
Ind19	SPS_1_Proxy	General indication binary 19
Ind20	SPS_1_Proxy	General indication binary 20

Ind21	SPS_1_Proxy	General indication binary 21
Ind22	SPS_1_Proxy	General indication binary 22
Ind23	SPS_1_Proxy	General indication binary 23
Ind24	SPS_1_Proxy	General indication binary 24
Ind25	SPS_1_Proxy	General indication binary 25
Ind26	SPS_1_Proxy	General indication binary 26
Ind27	SPS_1_Proxy	General indication binary 27
Ind28	SPS_1_Proxy	General indication binary 28
Ind29	SPS_1_Proxy	General indication binary 29
Ind30	SPS_1_Proxy	General indication binary 30

Logical Node Type: GGIO2

Description: 20 General IO binary indicators.

LN Class: GGIO

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
Ind1	SPS_1_Proxy	General indication binary 1
Ind2	SPS_1_Proxy	General indication binary 2
Ind3	SPS_1_Proxy	General indication binary 3
Ind4	SPS_1_Proxy	General indication binary 4
Ind5	SPS_1_Proxy	General indication binary 5
Ind6	SPS_1_Proxy	General indication binary 6
Ind7	SPS_1_Proxy	General indication binary 7
Ind8	SPS_1_Proxy	General indication binary 8
Ind9	SPS_1_Proxy	General indication binary 9
Ind10	SPS_1_Proxy	General indication binary 10
Ind11	SPS_1_Proxy	General indication binary 11

Ind12	SPS_1_Proxy	General indication binary 12
Ind13	SPS_1_Proxy	General indication binary 13
Ind14	SPS_1_Proxy	General indication binary 14
Ind15	SPS_1_Proxy	General indication binary 15
Ind16	SPS_1_Proxy	General indication binary 16
Ind17	SPS_1_Proxy	General indication binary 17
Ind18	SPS_1_Proxy	General indication binary 18
Ind19	SPS_1_Proxy	General indication binary 19
Ind20	SPS_1_Proxy	General indication binary 20

Logical Node Type: GGIO3

Description: 21 General IO binary indicators.

LN Class: GGIO

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
Ind1	SPS_1_Proxy	General indication binary 1
Ind2	SPS_1_Proxy	General indication binary 2
Ind3	SPS_1_Proxy	General indication binary 3
Ind4	SPS_1_Proxy	General indication binary 4
Ind5	SPS_1_Proxy	General indication binary 5
Ind6	SPS_1_Proxy	General indication binary 6
Ind7	SPS_1_Proxy	General indication binary 7
Ind8	SPS_1_Proxy	General indication binary 8
Ind9	SPS_1_Proxy	General indication binary 9
Ind10	SPS_1_Proxy	General indication binary 10
Ind11	SPS_1_Proxy	General indication binary 11
Ind12	SPS_1_Proxy	General indication binary 12

Ind13	SPS_1_Proxy	General indication binary 13
Ind14	SPS_1_Proxy	General indication binary 14
Ind15	SPS_1_Proxy	General indication binary 15
Ind16	SPS_1_Proxy	General indication binary 16
Ind17	SPS_1_Proxy	General indication binary 17
Ind18	SPS_1_Proxy	General indication binary 18
Ind19	SPS_1_Proxy	General indication binary 19
Ind20	SPS_1_Proxy	General indication binary 20
Ind21	SPS_1_Proxy	General indication binary 21

Logical Node Type: GGIO4

Description: 24 General IO binary indicators.

LN Class: GGIO

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
Ind1	SPS_1_Proxy	General indication binary 1
Ind2	SPS_1_Proxy	General indication binary 2
Ind3	SPS_1_Proxy	General indication binary 3
Ind4	SPS_1_Proxy	General indication binary 4
Ind5	SPS_1_Proxy	General indication binary 5
Ind6	SPS_1_Proxy	General indication binary 6
Ind7	SPS_1_Proxy	General indication binary 7
Ind8	SPS_1_Proxy	General indication binary 8
Ind9	SPS_1_Proxy	General indication binary 9
Ind10	SPS_1_Proxy	General indication binary 10
Ind11	SPS_1_Proxy	General indication binary 11
Ind12	SPS_1_Proxy	General indication binary 12

Ind13	SPS_1_Proxy	General indication binary 13
Ind14	SPS_1_Proxy	General indication binary 14
Ind15	SPS_1_Proxy	General indication binary 15
Ind16	SPS_1_Proxy	General indication binary 16
Ind17	SPS_1_Proxy	General indication binary 17
Ind18	SPS_1_Proxy	General indication binary 18
Ind19	SPS_1_Proxy	General indication binary 19
Ind20	SPS_1_Proxy	General indication binary 20
Ind21	SPS_1_Proxy	General indication binary 21
Ind22	SPS_1_Proxy	General indication binary 22
Ind23	SPS_1_Proxy	General indication binary 23
Ind24	SPS_1_Proxy	General indication binary 24

Logical Node Type: GGIO5

Description: 1 General IO binary indicator.

LN Class: GGIO

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
Ind	SPS_1_Proxy	General indication binary

Logical Node Type: GGIO6

Description: 13 General IO binary indicators.

LN Class: GGIO

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
Ind1	SPS_1_Proxy	General indication binary 1
Ind2	SPS_1_Proxy	General indication binary 2
Ind3	SPS_1_Proxy	General indication binary 3
Ind4	SPS_1_Proxy	General indication binary 4
Ind5	SPS_1_Proxy	General indication binary 5
Ind6	SPS_1_Proxy	General indication binary 6
Ind7	SPS_1_Proxy	General indication binary 7
Ind8	SPS_1_Proxy	General indication binary 8
Ind9	SPS_1_Proxy	General indication binary 9
Ind10	SPS_1_Proxy	General indication binary 10
Ind11	SPS_1_Proxy	General indication binary 11
Ind12	SPS_1_Proxy	General indication binary 12
Ind13	SPS_1_Proxy	General indication binary 13

Logical Node Type: GGIO7

Description: 1 General IO integer indicator.

LN Class: GGIO

Attribute	Attr. Type	Description
Mod	INC_1_Mod	Mode
Beh	INS_1_Beh	Behavior
Health	INS_1_Health	Health
NamPlt	LPL_2_NamPlt	Name plate
IntIn	INS_1_Int	General indication integer

Common Data Class Definitions

The definition tables for each of the Common Data Classes used in the Logical Node definitions are presented in the following sub-sections.

From an application point-of-view the data attributes of a Common Data Class are classified according to their specific use. The characterization of data attributes, and the services that they support/provide, will be through the use of 'Functional Constraints'. The Functional Constraints are specified by the Table N.21.

Table N.21: Functional Constraints

FC Name	Semantic	Source Definition
BR	Buffered Reports	IEC 61850 – 7 - 2
CF	Configuration	IEC 61850 – 7 - 2
CO	Control	IEC 61850 – 7 - 2
DC	Description	IEC 61850 – 7 - 2
EX	Extended Definition	IEC 61850 – 7 - 2
GO	GOOSE Control	IEC 61850 – 7 - 2
GS	GSSE Control (UCA2GOOSE)	IEC 61850 – 7 - 2
LG	Logging	IEC 61850 – 7 - 2
MS	Multicast Sampled Value Control	IEC 61850 – 7 - 2
RP	Unbuffered Reports	IEC 61850 – 7 - 2
SE	Setting Group Editable	IEC 61850 – 7 - 2
SG	Setting Group	IEC 61850 – 7 - 2
SP	Set Point	IEC 61850 – 7 - 2

ST	Status information	IEC 61850 – 7 - 2
SV	Substitution Values	IEC 61850 – 7 - 2
US	Unicast Sampled Value Control	IEC 61850 – 7 - 2
XX	Data Attribute Service Parameters	IEC 61850 – 7 - 2

Common Data Class: INC_1_Mod

Description: Controllable integer status

CDC Class: INC

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
stVal	Enum	ST	Mod		
q	Quality	ST			
t	Timestamp	ST			
ctlModel	Enum	CF	ctlModels		

Common Data Class: INS_1_Beh

Description: Integer status

CDC Class: INC

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
stVal	Enum	ST	Beh		
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: INS_1_Health

Description: Integer status

CDC Class: INC

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
stVal	Enum	ST	Health		
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: LPL_1_NamPlt

Description: Logical node name plate

CDC Class: LPL

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
vendor	VisString255	DC	“ERL”		
swRev	VisString255	DC			
d	VisString255	DC			
configRev	VisString255	DC			
lnNs	VisString255	EX			

Common Data Class: LPL_1_PhyNamSPRO

Description: Device name plate

CDC Class: DPL

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
vendor	VisString255	DC	“ERL”		
hwRev	VisString255	DC			
swRev	VisString255	DC			
serNum	VisString255	DC			

vendor	VisString255	DC			
model	VisString255	DC	"SPRO-4001"		

Common Data Class: LPL_1_PhyHealth

Description: Integer status

CDC Class: INS

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
stVal	Enum	ST	PhyHealth		
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: SPS_1_Proxy

Description: Single point status

CDC Class: SPS

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
stVal	BOOLEAN	ST			
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: LPL_2_NamPlt

Description: Logical node name plate

CDC Class: LPL

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
vendor	VisString255	DC	"ERL"		
swRev	VisString255	DC			

d	VisString255	DC			

Common Data Class: ACD_1_Str

Description: Directional Protection activation information

CDC Class: ACD

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
general	BOOLEAN	ST			
dirGeneral	ENUMERATED	ST	dirGeneral		
phsA	BOOLEAN	ST			
dirPhsA	ENUMERATED	ST	dirGeneral		
phsB	BOOLEAN	ST			
dirPhsB	ENUMERATED	ST	dirGeneral		
phsB	BOOLEAN	ST			
dirPhsB	ENUMERATED	ST	dirGeneral		
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: ACT_1_Op

Description: Protection activation information

CDC Class: ACT

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
general	BOOLEAN	ST			
phsA	BOOLEAN	ST			
phsB	BOOLEAN	ST			
phsB	BOOLEAN	ST			
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: SHA_1_Op

Description: Subharmonic protection activation information

CDC Class: ACT

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
general	BOOLEAN	ST			
phsA	BOOLEAN	ST			
phsB	BOOLEAN	ST			
phsC	BOOLEAN	ST			
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: MV_1

Description: Measured value

CDC Class: MV

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
mag	AnalogueValue_ Float	MX			
q	Quality	MX			
t	Timestamp	MX			

Common Data Class: CMV_1_Mag

Description: Complex measured value

CDC Class: CMV

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
cVal	Vector_2_Mag	MX			
q	Quality	MX			
t	Timestamp	MX			

Common Data Class: WYE_1_Mag

Description: Phase to ground measured values

CDC Class: WYE

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
phsA	CMV_1_Mag			Phase A value	
phsB	CMV_1_Mag			Phase B value	
phsC	CMV_1_Mag			Phase C value	

Common Data Class: CMW_1_Both

Description: Complex measured value

CDC Class: CMV

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
cVal	Vector_1	MX			
q	Quality	MX			
t	Timestamp	MX			

Common Data Class: WYE_2_Both

Description: Phase to ground measured values

CDC Class: WYE

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
phsA	CMV_1_Both			Phase A value	
phsB	CMV_1_Both			Phase B value	
phsC	CMV_1_Both			Phase C value	

Common Data Class: WYE_3_SHD

Description: Phase to ground measured values

CDC Class: WYE

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
phsA	SHMV_1			Phase A sub-harmonic	
phsB	SHMV_1			Phase B sub-harmonic	
phsC	SHMV_1			Phase C sub-harmonic	

Common Data Class: SHMV_1

Description: Subharmonic measured value

CDC Class: CMV

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
cVal	Vector_2_Mag	MX		Subharmonic magnitude	
q	Quality	MX			
t	Timestamp	MX			
cHz	Vector_2_Mag	MX		Subharmonic frequency	X
type	Enum	MX	SHDTyp	Subharmonic frequency	X

Common Data Class: ACD_2_Str

Description: Subharmonic protection activation information

CDC Class: ACD

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
general	BOOLEAN	ST			
dirGeneral	Enum	ST	dirGeneral	Set to “unknown”	
phsA	BOOLEAN	ST			
dirPhsA	Enum	ST	dirGeneral	Set to “unknown”	
phsB	BOOLEAN	ST			
dirPhsB	Enum	ST	dirGeneral	Set to “unknown”	
phsC	BOOLEAN	ST			
dirPhsC	Enum	ST	dirGeneral	Set to “unknown”	
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: INS_1_Int

Description: Integer status

CDC Class: INC

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
stVal	INT32	ST		Integer status	
q	Quality	ST			
t	Timestamp	ST			

Common Data Class: SHM_2

Description: Subharmonic measured value

CDC Class: CMV

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
cVal	Vector_2_Mag	MX		Subharmonic magnitude	
q	Quality	MX			
t	Timestamp	MX			
cHz	Vector_2_Mag	MX		Subharmonic frequency	

Common Data Class: WYE_4_SHD

Description: Phase to ground measured values

CDC Class: WYE

Attribute Name	Attribute Type	FC	Value/Value Range	Comment	X
phsA	SHMV_2			Phase A sub-harmonic	
phsB	SHMV_2			Phase B sub-harmonic	
phsC	SHMV_2			Phase C sub-harmonic	

Common Data Attribute Type Definitions

Common data attribute types, known herein as components, are defined for use in the Common Data Classes defined in the sections above.

Component: AnalogValue_Float

Comment: General Analog Value

Parent Type: AnalogValue

Attribute Name	Attribute Type	Value/Value Range	X
f	FLOAT32	Floating point value	

Component: Vector_1

Comment: Complex Value containing magnitude and angle

Parent Type: Vector

Attribute Name	Attribute Type	Value/Value Range	X
mag	AnalogValue_Float	Floating point value	
ang	AnalogValue_Float	Floating point value	

Component: Vector_2_Mag

Comment: Complex Value containing magnitude only

Parent Type: Vector

Attribute Name	Attribute Type	Value/Value Range	X
mag	AnalogValue_Float	Floating point value	

Enumerated Type Definitions

The following sub-sections specify the enumerations that are associated with some Common Data Class attributes. The definition of enumerations is according to IEC 61850 7-3 and IEC 61850 7-4 unless otherwise stated.

Enumerated type: Mod

Description: Mode

Ord	Semantic
1	on
2	blocked
3	test
4	test/blocked
5	off

Enumerated type: CtlModel

Description: Control Mode

Ord	Semantic
0	status-only
1	direct-with-normal-security
2	sbo-with-normal-security
3	direct-with-enhanced-security
5	sbo-with-enhanced-security

Enumerated type: Beh

Description: Behaviour

Ord	Semantic
1	on
2	blocked
3	test

4	test/blocked
5	off

Enumerated type: Health

Description: Health

Ord	Semantic
1	Ok
2	Warning
3	Alarm

Enumerated type: PhyHealth

Description: Health

Ord	Semantic
1	Ok
2	Warning
3	Alarm

Enumerated type: dirGeneral

Description: Direction

Ord	Semantic
1	unknown
2	forward
3	backward
4	both

Enumerated type: dirPhs

Description: Direction

Ord	Semantic
1	unknown
2	forward
3	backward

Enumerated type: SHDTyp

Description: ERL custom subharmonic disturbance type

Ord	Semantic
0	none
1	nom
2	tshd
3	nom-tshd
4	fund
5	nom-fund
6	tshd-fund
7	nom-tshd-fund
8	opd
9	nom-opd
10	tshd-opd
11	nom-tshd-opd
12	fund-opd
13	nom-fund-opd
14	tshd-fund-opd
15	nom-tshd-fund-opd

N.3 Data Mapping Specifications

ICD file defines the following logical devices.

- SPRO-4001Protection;
- Measurements;
- FaultData;
- VirtualInputs;
- System.

SPRO-4001 Logical Nodes

Table N.22 defines the list of SPRO-4001 Logical Nodes (LN).

Note:

System logical nodes (group L) are not shown in the Table N.22.

Table N.22: SPRO-4001 Logical Nodes

LD Name	LN Name	LN description	ANSI	Comments
Protection	D27MnPTUV1	Undervoltage	27	27 Main Trip & Alarm
Protection	D27AuxPTUV2	Undervoltage	27	27 Auxiliary Trip & Alarm
Protection	D59MnPTOV1	Overvoltage	59	59-1 Main Trip & Alarm
Protection	D59MnPTOV2	Overvoltage	59	59-2 Main Trip & Alarm
Protection	D59AuxPTOV3	Overvoltage	59	59-1 Auxiliary & Alarm
Protection	D59AuxPTOV4	Overvoltage	59	59-2 Auxiliary Trip & Alarm
Protection	D50LSPIOC1	Instantaneous Overcurrent	50LS	50LS current 1
Protection	D50LSPIOC2	Instantaneous Overcurrent	50LS	50LS current 2
Protection	D50LSPIOC3	Instantaneous Overcurrent	50LS	50LS current 3
Protection	D50LSPIOC4	Instantaneous Overcurrent	50LS	50LS current 4
Protection	D50LSPIOC5	Instantaneous Overcurrent	50LS	50LS summation 1
Protection	D50LSPIOC6	Instantaneous Overcurrent	50LS	50LS summation 2
Protection	D50LSPIOC7	Instantaneous Overcurrent	50LS	50LS summation 3
Protection	D50LSPIOC8	Instantaneous Overcurrent	50LS	50LS summation 4
Protection	Main1PSHD1	Subharmonic Distortion		SHD Main Voltage detector 1 Trip & Alarm
Protection	Main2PSHD2	Subharmonic Distortion		SHD Main Voltage detector 2 Trip & Alarm
Protection	Aux1PSHD3	Subharmonic Distortion		SHD Auxiliary Voltage detector 1 Trip & Alarm
Protection	Aux2PSHD4	Subharmonic Distortion		SHD Auxiliary Voltage detector 2 Trip & Alarm

Protection	I1D1PSHD5	Subharmonic Distortion		SHD Current 1 detector 1 Trip & Alarm
Protection	I1D2PSHD6	Subharmonic Distortion		SHD Current 1 detector 2 Trip & Alarm
Protection	I2D1PSHD7	Subharmonic Distortion		SHD Current 2 detector 1 Trip & Alarm
Protection	I2D2PSHD8	Subharmonic Distortion		SHD Current 2 detector 2 Trip & Alarm
Protection	I3D1PSHD9	Subharmonic Distortion		SHD Current 3 detector 1 Trip & Alarm
Protection	I3D2PSHD10	Subharmonic Distortion		SHD Current 3 detector 2 Trip & Alarm
Protection	I4D1PSHD11	Subharmonic Distortion		SHD Current 4 detector 1 Trip & Alarm
Protection	I4D2PSHD12	Subharmonic Distortion		SHD Current 4 detector 2 Trip & Alarm
Protection	S1D1PSHD13	Subharmonic Distortion		SHD Summation 1 detector 1 Trip & Alarm
Protection	S1D2PSHD14	Subharmonic Distortion		SHD Summation 1 detector 2 Trip & Alarm
Protection	S2D1PSHD15	Subharmonic Distortion		SHD Summation 2 detector 1 Trip & Alarm
Protection	S2D2PSHD16	Subharmonic Distortion		SHD Summation 2 detector 2 Trip & Alarm
Protection	S3D2PSHD17	Subharmonic Distortion		SHD Summation 3 detector 1 Trip & Alarm
Protection	S3D2PSHD18	Subharmonic Distortion		SHD Summation 3 detector 2 Trip & Alarm
Protection	S4D2PSHD19	Subharmonic Distortion		SHD Summation 4 detector 1 Trip & Alarm
Protection	S4D2PSHD20	Subharmonic Distortion		SHD Summation 4 detector 2 Trip & Alarm
Measure-ments	Pwr1MMXU1	Measurement		Power Channel 1 metering data: Total Active Power; Total Reactive Power; Total Apparent Power; Average Power Factor; Phase active powers; Phase reactive powers; Phase apparent powers; Phase power factors.
Measure-ments	Pwr2MMXU2	Measurement		Power Channel 2 metering data: Total Active Power; Total Reactive Power; Total Apparent Power; Average Power Factor; Phase active powers; Phase reactive powers; Phase apparent powers; Phase power factors.
Measure-ments	MVMMXU3	Measurement		Main Voltage 3-phase metering data
Measure-ments	AVMMXU4	Measurement		Auxiliary Voltage 3-phase metering data
Measure-ments	I1MMXU5	Measurement		Current 1 3-phase metering data
Measure-ments	I2MMXU6	Measurement		Current 2 3-phase metering data

Measure-ments	I3MMXU7	Measurement		Current 3 3-phase metering data
Measure-ments	I4MMXU8	Measurement		Current 4 3-phase metering data
Measure-ments	S1MMXU9	Measurement		Summation-1 3-phase metering data
Measure-ments	S2MMXU10	Measurement		Summation-2 3-phase metering data
Measure-ments	S3MMXU11	Measurement		Summation-3 3-phase metering data
Measure-ments	S4MMXU12	Measurement		Summation-4 3-phase metering data
Measure-ments	MVSHMMXU13	Measurement		Main Voltage 3-phase subharmonic metering data
Measure-ments	AVSHMMXU14	Measurement		Auxiliary Voltage 3-phase subharmonic metering data
Measure-ments	I1SHMMXU15	Measurement		Current 1 3-phase subharmonic metering data
Measure-ments	I2SHMMXU16	Measurement		Current 2 3-phase subharmonic metering data
Measure-ments	I3SHMMXU17	Measurement		Current 3 3-phase subharmonic metering data
Measure-ments	I4SHMMXU18	Measurement		Current 4 3-phase subharmonic metering data
Measure-ments	S1SHMMXU19	Measurement		Summation 1 3-phase subharmonic metering data
Measure-ments	S2SHMMXU20	Measurement		Summation 2 3-phase subharmonic metering data
Measure-ments	S3SHMMXU21	Measurement		Summation 3 3-phase subharmonic metering data
Measure-ments	S4SHMMXU22	Measurement		Summation 4 3-phase subharmonic metering data
FaultData	D59M1MMXU1	Measurement	59	59-1 Main fault voltages
FaultData	D59M2MMXU2	Measurement	59	59-2 Main fault voltages
FaultData	D59A1MMXU3	Measurement	59	59-1 Auxiliary fault voltages
FaultData	D59A2MMXU4	Measurement	59	59-2 Auxiliary fault voltages
FaultData	D27MMMXU5	Measurement	27	27 Main fault voltages
FaultData	D27AMMXU6	Measurement	27	27 Auxiliary fault voltages
FaultData	D50I1MMXU7	Measurement	50LS	50LS Current 1 fault currents
FaultData	D50I2MMXU8	Measurement	50LS	50LS Current 2 fault currents
FaultData	D50I3MMXU9	Measurement	50LS	50LS Current 3 fault currents
FaultData	D50I4MMXU10	Measurement	50LS	50LS Current 4 fault currents

FaultData	D50S1MMXU11	Measurement	50LS	50LS Summation 1 fault currents
FaultData	D50S2MMXU12	Measurement	50LS	50LS Summation 2 fault currents
FaultData	D50S3MMXU13	Measurement	50LS	50LS Summation 3 fault currents
FaultData	D50S4MMXU14	Measurement	50LS	50LS Summation 4 fault currents
FaultData	MSD1MMXU15	Measurement		Main Voltage subharmonic detector 1 fault data
FaultData	MSD2MMXU16	Measurement		Main Voltage subharmonic detector 2 fault data
FaultData	ASD1MMXU17	Measurement		Auxiliary Voltage subharmonic detector 1 fault data
FaultData	ASD2MMXU18	Measurement		Auxiliary Voltage subharmonic detector 2 fault data
FaultData	I1SD1MMXU19	Measurement		Current 1 subharmonic detector 1 fault data
FaultData	I1SD2MMXU20	Measurement		Current 1 subharmonic detector 2 fault data
FaultData	I2SD1MMXU21	Measurement		Current 2 subharmonic detector 1 fault data
FaultData	I2SD2MMXU22	Measurement		Current 2 subharmonic detector 2 fault data
FaultData	I3SD1MMXU23	Measurement		Current 3 subharmonic detector 1 fault data
FaultData	I3SD2MMXU24	Measurement		Current 3 subharmonic detector 2 fault data
FaultData	I4SD1MMXU25	Measurement		Current 4 subharmonic detector 1 fault data
FaultData	I4SD2MMXU26	Measurement		Current 4 subharmonic detector 2 fault data
FaultData	S1SD1MMXU27	Measurement		Summation 1 subharmonic detector 1 fault data
FaultData	S1SD2MMXU28	Measurement		Summation 1 subharmonic detector 2 fault data
FaultData	S2SD1MMXU29	Measurement		Summation 2 subharmonic detector 1 fault data
FaultData	S2SD2MMXU30	Measurement		Summation 2 subharmonic detector 2 fault data
FaultData	S3SD1MMXU31	Measurement		Summation 3 subharmonic detector 1 fault data
FaultData	S3SD2MMXU32	Measurement		Summation 3 subharmonic detector 2 fault data
FaultData	S4SD1MMXU33	Measurement		Summation 4 subharmonic detector 1 fault data
FaultData	S4SD2MMXU34	Measurement		Summation 4 subharmonic detector 2 fault data
VirtualIn-puts	SUBSCRGGIO1	Generic IO		30 External GOOSE Virtual Inputs
System	VIGGIO1	Generic IO		30 Virtual Inputs
System	EIGGIO2	Generic IO		20 External Inputs
System	OCGGIO3	Generic IO		21 Output Contacts
System	PLGGIO4	Generic IO		24 ProLogic functions
System	SChAlmGGIO5	Generic IO		Self-Check Alarm
System	TSAlmGGIO6	Generic IO		Time Synchronization Alarm
System	ComAlmGGIO7	Generic IO		Communication Alarm

System	LEDGGIO8	Generic IO		LEDs status
System	SGGIO9	Generic IO		Active Setting group

Logical Node Specifications

The following sections provide detailed information on the SPRO-4001 Logical Devices and Logical Nodes as defined in Table N.22 on page 41.

Protection Logical Device

D27MnPTUV1

This section defines data for the logical node D27MnPTUV1.

Data Name	Name
D27MnPTUV1STStr$general	27 Main Pickup
D27MnPTUV1STStr$ dirGeneral	27 Main Direction (set to “unknown”)
D27MnPTUV1STStr$phsA	27 Main Pickup A
D27MnPTUV1STStr$dirPhsA	27 Main phase A Direction (set to “unknown”)
D27MnPTUV1STStr$phsB	27 Main Pickup B
D27MnPTUV1STStr$dirPhsB	27 Main phase B Direction (set to “unknown”)
D27MnPTUV1STStr$phsC	27 Main Pickup C
D27MnPTUV1STStr$dirPhsC	27 Main phase C Direction (set to “unknown”)
D27MnPTUV1STOp$general	27 Main Trip
D27MnPTUV1STOp$phsA	27 Main Trip A
D27MnPTUV1STOp$phsB	27 Main Trip B
D27MnPTUV1STOp$phsC	27 Main Trip C

D27AuxPTUV2

This section defines data for the logical node D27AuxPTUV2

Data Name	Name
D27 AuxPTUV2STStr$general	27 Auxiliary Pickup
D27AuxPTUV2STStr$dirGeneral	27 Auxiliary Direction (set to unknown”)
D27AuxPTUV2STStr$phsA	27 Auxiliary Pickup A
D27AuxPTUV2STStr$dirPhsA	27 Auxiliary phase A Direction (set to “unknown”)
D27AuxPTUV2STStr$phsB	27 Auxiliary Pickup B
D27AuxPTUV2STStr$dirPhsB	27 Auxiliary phase B Direction (set to “unknown”)
D27AuxPTUV2STStr$phsC	27 Auxiliary Pickup C
D27AuxPTUV2STStr$dirPhsC	27 Auxiliary phase C Direction (set to “unknown”)
D27AuxPTUV2STOp$general	27 Auxiliary Trip
D27AuxPTUV2STOp$phsA	27 Auxiliary Trip A
D27AuxPTUV2STOp$phsB	27 Auxiliary Trip B
D27AuxPTUV2STOp$phsC	27 Auxiliary Trip C

D59MnPTOV1

This section defines data for the logical node D59MnPTOV1.

Data Name	Name
D59MnPTOV1STStr$general	59-1 Main Pickup
D59MnPTOV1STStr$dirGeneral	59-1 Main Direction (set to “unknown”)
D59MnPTOV1STStr$phsA	59-1 Main Pickup A
D59MnPTOV1STStr$dirPhsA	59-1 Main phase A Direction (set to “unknown”)
D59MnPTOV1STStr$phsB	59-1 Main Pickup B
D59MnPTOV1STStr$dirPhsB	59-1 Main phase B Direction (set to “unknown”)
D59MnPTOV1STStr$phsC	59-1 Main Pickup C
D59MnPTOV1STStr$dirPhsC	59-1 Main phase C Direction (set to “unknown”)
D59MnPTOV1STOp$general	59-1 Main Trip

D59MnPTOV1STOp$phsA	59-1 Main Trip A
D59MnPTOV1STOp$phsB	59-1 Main Trip B
D59MnPTOV1STOp$phsC	59-1 Main Trip C

D59MnPTOV2

This section defines data for the logical node D59MnPTOV2.

Data Name	Name
D59MnPTOV2STStr$general	59-2 Main Pickup
D59MnPTOV2STStr$dirGeneral	59-2 Main Direction (set to “unknown”)
D59MnPTOV2STStr$phsA	59-2 Main Pickup A
D59MnPTOV2STStr$dirPhsA	59-2 Main phase A Direction (set to “unknown”)
D59MnPTOV2STStr$phsB	59-2 Main Pickup B
D59MnPTOV2STStr$dirPhsB	59-2 Main phase B Direction (set to “unknown”)
D59MnPTOV2STStr$phsC	59-2 Main Pickup C
D59MnPTOV2STStr$dirPhsC	59-2 Main phase C Direction (set to “unknown”)
D59MnPTOV2STOp$general	59-2 Main Trip
D59MnPTOV2STOp$phsA	59-2 Main Trip A
D59MnPTOV2STOp$phsB	59-2 Main Trip B
D59MnPTOV2STOp$phsC	59-2 Main Trip C

D59AuxPTOV3

This section defines data for the logical node D59AuxPTOV3.

Data Name	Name
D59AuxPTOV3STStr$general	59-1 Auxiliary Pickup
D59AuxPTOV3STStr$dirGeneral	59-1 Auxiliary Direction (set to “unknown”)
D59AuxPTOV3STStr$phsA	59-1 Auxiliary Pickup A
D59AuxPTOV3STStr$dirPhsA	59-1 Auxiliary phase A Direction (set to “unknown”)
D59AuxPTOV3STStr$phsB	59-1 Auxiliary Pickup B
D59AuxPTOV3STStr$dirPhsB	59-1 Auxiliary phase B Direction (set to “unknown”)
D59AuxPTOV3STStr$phsC	59-1 Auxiliary Pickup C
D59AuxPTOV3STStr$dirPhsC	59-1 Auxiliary phase C Direction (set to “unknown”)
D59AuxPTOV3STOp$general	59-1 Auxiliary Trip
D59AuxPTOV3STOp$phsA	59-1 Auxiliary Trip A
D59AuxPTOV3STOp$phsB	59-1 Auxiliary Trip B
D59AuxPTOV3STOp$phsC	59-1 Auxiliary Trip C

D59AuxPTOV4

This section defines data for the logical node D59AuxPTOV4.

Data Name	Name
D59AuxPTOV4STStr$general	59-2 Auxiliary Pickup
D59AuxPTOV4STStr$dirGeneral	59-2 Auxiliary Direction (set to “unknown”)
D59AuxPTOV4STStr$phsA	59-2 Auxiliary Pickup A
D59AuxPTOV4STStr$dirPhsA	59-2 Auxiliary phase A Direction (set to “unknown”)
D59AuxPTOV4STStr$phsB	59-2 Auxiliary Pickup B
D59AuxPTOV4STStr$dirPhsB	59-2 Auxiliary phase B Direction (set to “unknown”)
D59AuxPTOV4STStr$phsC	59-2 Auxiliary Pickup C

D59AuxPTOV4STStr$dirPhsC	59-2 Auxiliary phase C Direction (set to “unknown”)
D59AuxPTOV4STOp$general	59-2 Auxiliary Trip
D59AuxPTOV4STOp$phsA	59-2 Auxiliary Trip A
D59AuxPTOV4STOp$phsB	59-2 Auxiliary Trip B
D59AuxPTOV4STOp$phsC	59-2 Auxiliary Trip C

D50LSPIOC1

This section defines data for the logical node D50LSPIOC1.

Data Name	Name
D50LSPIOC1STStr$general	50LS Current 1 Pickup
D50LSPIOC1STStr$dirGeneral	50LS Current 1 Direction (set to “unknown”)
D50LSPIOC1STStr$phsA	50LS Current 1 Pickup A
D50LSPIOC1STStr$dirPhsA	50LS Current 1 phase A Direction (set to “unknown”)
D50LSPIOC1STStr$phsB	50LS Current 1 Pickup B
D50LSPIOC1STStr$dirPhsB	50LS Current 1 phase B Direction (set to “unknown”)
D50LSPIOC1STStr$phsC	50LS Current 1 Pickup C
D50LSPIOC1STStr$dirPhsC	50LS Current 1 phase C Direction (set to “unknown”)
D50LSPIOC1STOp$general	50LS Current 1 Trip
D50LSPIOC1STOp$phsA	50LS Current 1 Trip A
D50LSPIOC1STOp$phsB	50LS Current 1 Trip B
D50LSPIOC1STOp$phsC	50LS Current 1 Trip C

D50LSPIOC2

This section defines data for the logical node D50LSPIOC2.

Data Name	Name
D50LSPIOC2STStr$general	50LS Current 2 Pickup
D50LSPIOC2STStr$dirGeneral	50LS Current 2 Direction (set to “unknown”)
D50LSPIOC2STStr$phsA	50LS Current 2 Pickup A
D50LSPIOC2STStr$dirPhsA	50LS Current 2 phase A Direction (set to “unknown”)
D50LSPIOC2STStr$phsB	50LS Current 2 Pickup B
D50LSPIOC2STStr$dirPhsB	50LS Current 2 phase B Direction (set to “unknown”)
D50LSPIOC2STStr$phsC	50LS Current 2 Pickup C
D50LSPIOC2STStr$dirPhsC	50LS Current 2 phase C Direction (set to “unknown”)
D50LSPIOC2STOp$general	50LS Current 2 Trip
D50LSPIOC2STOp$phsA	50LS Current 2 Trip A
D50LSPIOC2STOp$phsB	50LS Current 2 Trip B
D50LSPIOC2STOp$phsC	50LS Current 2 Trip C

D50LSPIOC3

This section defines data for the logical node D50LSPIOC3.

Data Name	Name
D50LSPIOC3STStr$general	50LS Current 3 Pickup
D50LSPIOC3STStr$dirGeneral	50LS Current 3 Direction (set to “unknown”)
D50LSPIOC3STStr$phsA	50LS Current 3 Pickup A
D50LSPIOC3STStr$dirPhsA	50LS Current 3 phase A Direction (set to “unknown”)
D50LSPIOC3STStr$phsB	50LS Current 3 Pickup B
D50LSPIOC3STStr$dirPhsB	50LS Current 3 phase B Direction (set to “unknown”)
D50LSPIOC3STStr$phsC	50LS Current 3 Pickup C

D50LSPIOC3STStr$dirPhsC	50LS Current 3 phase C Direction (set to “unknown”)
D50LSPIOC3STOp$general	50LS Current 3 Trip
D50LSPIOC3STOp$phsA	50LS Current 3 Trip A
D50LSPIOC3STOp$phsB	50LS Current 3 Trip B
D50LSPIOC3STOp$phsC	50LS Current 3 Trip C

D50LSPIOC4

This section defines data for the logical node D50LSPIOC4.

Data Name	Name
D50LSPIOC4STStr$general	50LS Current 4 Pickup
D50LSPIOC4STStr$dirGeneral	50LS Current 4 Direction (set to “unknown”)
D50LSPIOC4STStr$phsA	50LS Current 4 Pickup A
D50LSPIOC4STStr$dirPhsA	50LS Current 4 phase A Direction (set to “unknown”)
D50LSPIOC4STStr$phsB	50LS Current 4 Pickup B
D50LSPIOC4STStr$dirPhsB	50LS Current 4 phase B Direction (set to “unknown”)
D50LSPIOC4STStr$phsC	50LS Current 4 Pickup C
D50LSPIOC4STStr$dirPhsC	50LS Current 4 phase C Direction (set to “unknown”)
D50LSPIOC4STOp$general	50LS Current 4 Trip
D50LSPIOC4STOp$phsA	50LS Current 4 Trip A
D50LSPIOC4STOp$phsB	50LS Current 4 Trip B
D50LSPIOC4STOp$phsC	50LS Current 4 Trip C

D50LSPIOC5

This section defines data for the logical node D50LSPIOC5.

Data Name	Name
D50LSPIOC5STStr$general	50LS Summation 1 Pickup
D50LSPIOC5STStr$dirGeneral	50LS Summation 1 Direction (set to “unknown”)
D50LSPIOC5STStr$phsA	50LS Summation 1 Pickup A
D50LSPIOC5STStr$dirPhsA	50LS Summation 1 phase A Direction (set to “unknown”)
D50LSPIOC5STStr$phsB	50LS Summation 1 Pickup B
D50LSPIOC5STStr$dirPhsB	50LS Summation 1 phase B Direction (set to “unknown”)
D50LSPIOC5STStr$phsC	50LS Summation 1 Pickup C
D50LSPIOC5STStr$dirPhsC	50LS Summation 1 phase C Direction (set to “unknown”)
D50LSPIOC5STOp$general	50LS Summation 1 Trip
D50LSPIOC5STOp$phsA	50LS Summation 1 Trip A
D50LSPIOC5STOp$phsB	50LS Summation 1 Trip B
D50LSPIOC5STOp$phsC	50LS Summation 1 Trip C

D50LSPIOC6

This section defines data for the logical node D50LSPIOC6.

Data Name	Name
D50LSPIOC6STStr$general	50LS Summation 2 Pickup
D50LSPIOC6STStr$dirGeneral	50LS Summation 2 Direction (set to “unknown”)
D50LSPIOC6STStr$phsA	50LS Summation 2 Pickup A
D50LSPIOC6STStr$dirPhsA	50LS Summation 2 phase A Direction (set to “unknown”)
D50LSPIOC6STStr$phsB	50LS Summation 2 Pickup B
D50LSPIOC6STStr$dirPhsB	50LS Summation 2 phase B Direction (set to “unknown”)
D50LSPIOC6STStr$phsC	50LS Summation 2 Pickup C

D50LSPIOC6STStr$dirPhsC	50LS Summation 2 phase C Direction (set to "unknown")
D50LSPIOC6STOp$general	50LS Summation 2 Trip
D50LSPIOC6STOp$phsA	50LS Summation 2 Trip A
D50LSPIOC6STOp$phsB	50LS Summation 2 Trip B
D50LSPIOC6STOp$phsC	50LS Summation 2 Trip C

D50LSPIOC7

This section defines data for the logical node D50LSPIOC7.

Data Name	Name
D50LSPIOC7STStr$general	50LS Summation 3 Pickup
D50LSPIOC7STStr$dirGeneral	50LS Summation 3 Direction (set to "unknown")
D50LSPIOC7STStr$phsA	50LS Summation 3 Pickup A
D50LSPIOC7STStr$dirPhsA	50LS Summation 3 phase A Direction (set to "unknown")
D50LSPIOC7STStr$phsB	50LS Summation 3 Pickup B
D50LSPIOC7STStr$dirPhsB	50LS Summation 3 phase B Direction (set to "unknown")
D50LSPIOC7STStr$phsC	50LS Summation 3 Pickup C
D50LSPIOC7STStr$dirPhsC	50LS Summation 3 phase C Direction (set to "unknown")
D50LSPIOC7STOp$general	50LS Summation 3 Trip
D50LSPIOC7STOp$phsA	50LS Summation 3 Trip A
D50LSPIOC7STOp$phsB	50LS Summation 3 Trip B
D50LSPIOC7STOp$phsC	50LS Summation 3 Trip C

D50LSPIOC8

This section defines data for the logical node D50LSPIOC8.

Data Name	Name
D50LSPIOC8STStr$general	50LS Summation 4 Pickup
D50LSPIOC8STStr$dirGeneral	50LS Summation 4 Direction (set to “unknown”)
D50LSPIOC8STStr$phsA	50LS Summation 4 Pickup A
D50LSPIOC8STStr$dirPhsA	50LS Summation 4 phase A Direction (set to “unknown”)
D50LSPIOC8STStr$phsB	50LS Summation 4 Pickup B
D50LSPIOC8STStr$dirPhsB	50LS Summation 4 phase B Direction (set to “unknown”)
D50LSPIOC8STStr$phsC	50LS Summation 4 Pickup C
D50LSPIOC8STStr$dirPhsC	50LS Summation 4 phase C Direction (set to “unknown”)
D50LSPIOC8STOp$general	50LS Summation 4 Trip
D50LSPIOC8STOp$phsA	50LS Summation 4 Trip A
D50LSPIOC8STOp$phsB	50LS Summation 4 Trip B
D50LSPIOC8STOp$phsC	50LS Summation 4 Trip C

Main1PSHD1

This section defines data for the logical node Main1PSHD1.

Data Name	Name
Main1PSHD1STCntAlm$stVal	SHD1 Main Voltage Pickup Counter Alarm
Main1PSHD1STStr$general	SHD1 Main Voltage Pickup
Main1PSHD1STStr$dirGeneral	SHD1 Main Voltage Direction (set to “unknown”)
Main1PSHD1STStr$phsA	SHD1 Main Voltage Pickup A
Main1PSHD1STStr$dirPhsA	SHD1 Main Voltage phase A Direction (set to “unknown”)
Main1PSHD1STStr$phsB	SHD1 Main Voltage Pickup B
Main1PSHD1STStr$dirPhsB	SHD1 Main Voltage phase B Direction (set to “unknown”)
Main1PSHD1STStr$phsC	SHD1 Main Voltage Pickup C

Main1PSHD1STStr$dirPhsC	SHD1 Main Voltage phase C Direction (set to “unknown”)
Main1PSHD1STOp$general	SHD1 Main Voltage Trip
Main1PSHD1STOp$phsA	SHD1 Main Voltage Trip A
Main1PSHD1STOp$phsB	SHD1 Main Voltage Trip B
Main1PSHD1STOp$phsC	SHD1 Main Voltage Trip C

Main2PSHD2

This section defines data for the logical node Main2PSHD2.

Data Name	Name
Main2PSHD2STCntAlm$stVal	SHD2 Main Voltage Pickup Counter Alarm
Main2PSHD2STStr$general	SHD2 Main Voltage Pickup
Main2PSHD2STStr$dirGeneral	SHD2 Main Voltage Direction (set to “unknown”)
Main2PSHD2STStr$phsA	SHD2 Main Voltage Pickup A
Main2PSHD2STStr$dirPhsA	SHD2 Main Voltage phase A Direction (set to “unknown”)
Main2PSHD2STStr$phsB	SHD2 Main Voltage Pickup B
Main2PSHD2STStr$dirPhsB	SHD2 Main Voltage phase B Direction (set to “unknown”)
Main2PSHD2STStr$phsC	SHD2 Main Voltage Pickup C
Main2PSHD2STStr$dirPhsC	SHD2 Main Voltage phase C Direction (set to “unknown”)
Main2PSHD2STOp$general	SHD2 Main Voltage Trip
Main2PSHD2STOp$phsA	SHD2 Main Voltage Trip A
Main2PSHD2STOp$phsB	SHD2 Main Voltage Trip B
Main2PSHD2STOp$phsC	SHD2 Main Voltage Trip C

Aux1PSHD3

This section defines data for the logical node Aux1PSHD3.

Data Name	Name
Aux1PSHD3STCntAlm$stVal	SHD1 Auxiliary Voltage Pickup Counter Alarm
Aux1PSHD3STStr$general	SHD1 Auxiliary Voltage Pickup
Aux1PSHD3STStr$dirGeneral	SHD1 Auxiliary Voltage Direction (set to “unknown”)
Aux1PSHD3STStr$phsA	SHD1 Auxiliary Voltage Pickup A
Aux1PSHD3STStr$dirPhsA	SHD1 Auxiliary Voltage phase A Direction (set to “unknown”)
Aux1PSHD3STStr$phsB	SHD1 Auxiliary Voltage Pickup B
Aux1PSHD3STStr$dirPhsB	SHD1 Auxiliary Voltage phase B Direction (set to “unknown”)
Aux1PSHD3STStr$phsC	SHD1 Auxiliary Voltage Pickup C
Aux1PSHD3STStr$dirPhsC	SHD1 Auxiliary Voltage phase C Direction (set to “unknown”)
Aux1PSHD3STOp$general	SHD1 Auxiliary Voltage Trip
Aux1PSHD3STOp$phsA	SHD1 Auxiliary Voltage Trip A
Aux1PSHD3STOp$phsB	SHD1 Auxiliary Voltage Trip B
Aux1PSHD3STOp$phsC	SHD1 Auxiliary Voltage Trip C

Aux2PSHD4

This section defines data for the logical node Aux2PSHD4.

Data Name	Name
Aux2PSHD4STCntAlm$stVal	SHD2 Auxiliary Voltage Pickup Counter Alarm
Aux2PSHD4STStr$general	SHD2 Auxiliary Voltage Pickup
Aux2PSHD4STStr$dirGeneral	SHD2 Auxiliary Voltage Direction (set to “unknown”)
Aux2PSHD4STStr$phsA	SHD2 Auxiliary Voltage Pickup A
Aux2PSHD4STStr$dirPhsA	SHD2 Auxiliary Voltage phase A Direction (set to “unknown”)
Aux2PSHD4STStr$phsB	SHD2 Auxiliary Voltage Pickup B

Aux2PSHD4STStr$dirPhsB	SHD2 Auxiliary Voltage phase B Direction (set to “unknown”)
Aux2PSHD4STStr$phsC	SHD2 Auxiliary Voltage Pickup C
Aux2PSHD4STStr$dirPhsC	SHD2 Auxiliary Voltage phase C Direction (set to “unknown”)
Aux2PSHD4STOp$general	SHD2 Auxiliary Voltage Trip
Aux2PSHD4STOp$phsA	SHD2 Auxiliary Voltage Trip A
Aux2PSHD4STOp$phsB	SHD2 Auxiliary Voltage Trip B
Aux2PSHD4STOp$phsC	SHD2 Auxiliary Voltage Trip C

I1D1PSHD5

This section defines data for the logical node I1D1PSHD5.

Data Name	**Name**
I1D1PSHD5STCntAlm$stVal	SHD1 Current 1 Pickup Counter Alarm
I1D1PSHD5STStr$general	SHD1 Current 1 Pickup
I1D1PSHD5STStr$dirGeneral	SHD1 Current 1 Direction (set to “unknown”)
I1D1PSHD5STStr$phsA	SHD1 Current 1 Pickup A
I1D1PSHD5STStr$dirPhsA	SHD1 Current 1 phase A Direction (set to “unknown”)
I1D1PSHD5STStr$phsB	SHD1 Current 1 Pickup B
I1D1PSHD5STStr$dirPhsB	SHD1 Current 1 phase B Direction (set to “unknown”)
I1D1PSHD5STStr$phsC	SHD1 Current 1 Pickup C
I1D1PSHD5STStr$dirPhsC	SHD1 Current 1 phase C Direction (set to “unknown”)
I1D1PSHD5STOp$general	SHD1 Current 1 Trip
I1D1PSHD5STOp$phsA	SHD1 Current 1 Trip A
I1D1PSHD5STOp$phsB	SHD1 Current 1 Trip B
I1D1PSHD5STOp$phsC	SHD1 Current 1 Trip C

I1D2PSHD6

This section defines data for the logical node I1D2PSHD6.

Data Name	Name
I1D2PSHD6STCntAlm$stVal	SHD2 Current 1 Pickup Counter Alarm
I1D2PSHD6STStr$general	SHD2 Current 1 Pickup
I1D2PSHD6STStr$dirGeneral	SHD2 Current 1 Direction (set to “unknown”)
I1D2PSHD6STStr$phsA	SHD2 Current 1 Pickup A
I1D2PSHD6STStr$dirPhsA	SHD2 Current 1 phase A Direction (set to “unknown”)
I1D2PSHD6STStr$phsB	SHD2 Current 1 Pickup B
I1D2PSHD6STStr$dirPhsB	SHD2 Current 1 phase B Direction (set to “unknown”)
I1D2PSHD6STStr$phsC	SHD2 Current 1 Pickup C
I1D2PSHD6STStr$dirPhsC	SHD2 Current 1 phase C Direction (set to “unknown”)
I1D2PSHD6STOp$general	SHD2 Current 1 Trip
I1D2PSHD6STOp$phsA	SHD2 Current 1 Trip A
I1D2PSHD6STOp$phsB	SHD2 Current 1 Trip B
I1D2PSHD6STOp$phsC	SHD2 Current 1 Trip C

I2D1PSHD7

This section defines data for the logical node I2D1PSHD7.

Data Name	Name
I2D1PSHD7STCntAlm$stVal	SHD1 Current 2 Pickup Counter Alarm
I2D1PSHD7STStr$general	SHD1 Current 2 Pickup
I2D1PSHD7STStr$general	SHD1 Current 2 Direction (set to “unknown”)
I2D1PSHD7STStr$phsA	SHD1 Current 2 Pickup A
I2D1PSHD7STStr$dirPhsA	SHD1 Current 2 phase A Direction (set to “unknown”)
I2D1PSHD7STStr$phsB	SHD1 Current 2 Pickup B

I2D1PSHD7STStr$dirPhsB	SHD1 Current 2 phase B Direction (set to “unknown”)
I2D1PSHD7STStr$phsC	SHD1 Current 2 Pickup C
I2D1PSHD7STStr$dirPhsC	SHD1 Current 2 phase C Direction (set to “unknown”)
I2D1PSHD7STOp$general	SHD1 Current 2 Trip
I2D1PSHD7STOp$phsA	SHD1 Current 2 Trip A
I2D1PSHD7STOp$phsB	SHD1 Current 2 Trip B
I2D1PSHD7STOp$phsC	SHD1 Current 2 Trip C

I2D2PSHD8

This section defines data for the logical node I2D2PSHD8.

Data Name	**Name**
I2D2PSHD8STCntAlm$stVal	SHD2 Current 2 Pickup Counter Alarm
I2D2PSHD8STStr$general	SHD2 Current 2 Pickup
I2D2PSHD8STStr$dirGeneral	SHD2 Current 2 Direction (set to “unknown”)
I2D2PSHD8STStr$phsA	SHD2 Current 2 Pickup A
I2D2PSHD8STStr$dirPhsA	SHD2 Current 2 phase A Direction (set to “unknown”)
I2D2PSHD8STStr$phsB	SHD2 Current 2 Pickup B
I2D2PSHD8STStr$dirPhsB	SHD2 Current 2 phase B Direction (set to “unknown”)
I2D2PSHD8STStr$phsC	SHD2 Current 2 Pickup C
I2D2PSHD8STStr$dirPhsC	SHD2 Current 2 phase C Direction (set to “unknown”)
I2D2PSHD8STOp$general	SHD2 Current 2 Trip
I2D2PSHD8STOp$phsA	SHD2 Current 2 Trip A
I2D2PSHD8STOp$phsB	SHD2 Current 2 Trip B
I2D2PSHD8STOp$phsC	SHD2 Current 2 Trip C

I3D1PSHD9

This section defines data for the logical node I3D1PSHD9.

Data Name	Name
I3D1PSHD9STCntAlm$stVal	SHD1 Current 3 Pickup Counter Alarm
I3D1PSHD9STStr$general	SHD1 Current 3 Pickup
I3D1PSHD9STStr$dirGeneral	SHD1 Current 3 Direction (set to “unknown”)
I3D1PSHD9STStr$phsA	SHD1 Current 3 Pickup A
I3D1PSHD9STStr$dirPhsA	SHD1 Current 3 phase A Direction (set to “unknown”)
I3D1PSHD9STStr$phsB	SHD1 Current 3 Pickup B
I3D1PSHD9STStr$dirPhsB	SHD1 Current 3 phase B Direction (set to “unknown”)
I3D1PSHD9STStr$phsC	SHD1 Current 3 Pickup C
I3D1PSHD9STStr$dirPhsC	SHD1 Current 3 phase C Direction (set to “unknown”)
I3D1PSHD9STOp$general	SHD1 Current 3 Trip
I3D1PSHD9STOp$phsA	SHD1 Current 3 Trip A
I3D1PSHD9STOp$phsB	SHD1 Current 3 Trip B
I3D1PSHD9STOp$phsC	SHD1 Current 3 Trip C

I3D2PSHD10

This section defines data for the logical node I3D2PSHD10.

Data Name	Name
I3D2PSHD10STCntAlm$stVal	SHD2 Current 3 Pickup Counter Alarm
I3D2PSHD10STStr$general	SHD2 Current 3 Pickup
I3D2PSHD10STStr$dirGeneral	SHD2 Current 3 Direction (set to “unknown”)
I3D2PSHD10STStr$phsA	SHD2 Current 3 Pickup A
I3D2PSHD10STStr$dirPhsA	SHD2 Current 3 phase A Direction (set to “unknown”)
I3D2PSHD10STStr$phsB	SHD2 Current 3 Pickup B
I3D2PSHD10STStr$dirPhsB	SHD2 Current 3 phase B Direction (set to “unknown”)

I3D2PSHD10STStr$phsC	SHD1 Current 3 Pickup C
I3D2PSHD10STStr$dirPhsC	SHD2 Current 3 phase C Direction (set to “unknown”)
I3D2PSHD10STOp$general	SHD2 Current 3 Trip
I3D2PSHD10STOp$phsA	SHD2 Current 3 Trip A
I3D2PSHD10STOp$phsB	SHD2 Current 3 Trip B
I3D2PSHD10STOp$phsC	SHD2 Current 3 Trip C

I4D1PSHD11

This section defines data for the logical node I4D1PSHD11.

Data Name	Name
I4D1PSHD11STCntAlm$stVal	SHD1 Current 4 Pickup Counter Alarm
I4D1PSHD11STStr$dirGeneral	SHD1 Current 4 Direction (set to “unknown”)
I4D1PSHD11STStr$general	SHD1 Current 4 Pickup
I4D1PSHD11STStr$phsA	SHD1 Current 4 Pickup A
I4D1PSHD11STStr$dirPhsA	SHD1 Current 4 phase A Direction (set to “unknown”)
I4D1PSHD11STStr$phsB	SHD1 Current 4 Pickup B
I4D1PSHD11STStr$dirPhsB	SHD1 Current 4 phase B Direction (set to “unknown”)
I4D1PSHD11STStr$phsC	SHD1 Current 4 Pickup C
I4D1PSHD11STStr$dirPhsC	SHD1 Current 4 phase C Direction (set to “unknown”)
I4D1PSHD11STOp$general	SHD1 Current 4 Trip
I4D1PSHD11STOp$phsA	SHD1 Current 4 Trip A
I4D1PSHD11STOp$phsB	SHD1 Current 4 Trip B
I4D1PSHD11STOp$phsC	SHD1 Current 4 Trip C

I4D2PSHD12

This section defines data for the logical node I4D2PSHD12.

Data Name	Name
I4D2PSHD12STCntAlm$stVal	SHD2 Current 4 Pickup Counter Alarm
I4D2PSHD12STStr$general	SHD2 Current 4 Pickup
I4D2PSHD12STStr$dirGeneral	SHD2 Current 4 Direction (set to “unknown”)
I4D2PSHD12STStr$phsA	SHD2 Current 4 Pickup A
I4D2PSHD12STStr$dirPhsA	SHD2 Current 4 phase A Direction (set to “unknown”)
I4D2PSHD12STStr$phsB	SHD2 Current 4 Pickup B
I4D2PSHD12STStr$dirPhsB	SHD2 Current 4 phase B Direction (set to “unknown”)
I4D2PSHD12STStr$phsC	SHD2 Current 4 Pickup C
I4D2PSHD12STStr$dirPhsC	SHD2 Current 4 phase C Direction (set to “unknown”)
I4D2PSHD12STOp$general	SHD2 Current 4 Trip
I4D2PSHD12STOp$phsA	SHD2 Current 4 Trip A
I4D2PSHD12STOp$phsB	SHD2 Current 4 Trip B
I4D2PSHD12STOp$phsC	SHD2 Current 4 Trip C

S1D1PSHD13

This section defines data for the logical node S1D1PSHD13.

Data Name	Name
S1D1PSHD13STCntAlm$stVal	SHD1 Summation 1 Pickup Counter Alarm
S1D1PSHD13STStr$general	SHD1 Summation 1 Pickup
S1D1PSHD13STStr$dirGeneral	SHD1 Summation 1 Direction (set to “unknown”)
S1D1PSHD13STStr$phsA	SHD1 Summation 1 Pickup A
S1D1PSHD13STStr$dirPhsA	SHD1 Summation 1 phase A Direction (set to “unknown”)
S1D1PSHD13STStr$phsB	SHD1 Summation 1 Pickup B
S1D1PSHD13STStr$dirPhsB	SHD1 Summation 1 phase B Direction (set to “unknown”)

S1D1PSHD13STStr$phsC	SHD1 Summation 1 Pickup C
S1D1PSHD13STStr$dirPhsC	SHD1 Summation 1 phase C Direction (set to “unknown”)
S1D1PSHD13STOp$general	SHD1 Summation 1 Trip
S1D1PSHD13STOp$phsA	SHD1 Summation 1 Trip A
S1D1PSHD13STOp$phsB	SHD1 Summation 1 Trip B
S1D1PSHD13STOp$phsC	SHD1 Summation 1 Trip C

S1D2PSHD14

This section defines data for the logical node S1D2PSHD14.

Data Name	**Name**
S1D2PSHD14STCntAlm$stVal	SHD2 Summation 1 Pickup Counter Alarm
S1D2PSHD14STStr$general	SHD2 Summation 1 Pickup
S1D2PSHD14STStr$dirGeneral	SHD2 Summation 1 Direction (set to “unknown”)
S1D2PSHD14STStr$phsA	SHD2 Summation 1 Pickup A
S1D2PSHD14STStr$dirPhsA	SHD2 Summation 1 phase A Direction (set to “unknown”)
S1D2PSHD14STStr$phsB	SHD2 Summation 1 Pickup B
S1D2PSHD14STStr$dirPhsB	SHD2 Summation 1 phase B Direction (set to “unknown”)
S1D2PSHD14STStr$phsC	SHD2 Summation 1 Pickup C
S1D2PSHD14STStr$dirPhsC	SHD2 Summation 1 phase C Direction (set to “unknown”)
S1D2PSHD14STOp$general	SHD2 Summation 1 Trip
S1D2PSHD14STOp$phsA	SHD2 Summation 1 Trip A
S1D2PSHD14STOp$phsB	SHD2 Summation 1 Trip B
S1D2PSHD14STOp$phsC	SHD2 Summation 1 Trip C

S2D1PSHD15

This section defines data for the logical node S2D1PSHD15.

Data Name	Name
S2D1PSHD15STCntAlm$stVal	SHD1 Summation 2 Pickup Counter Alarm
S2D1PSHD15STStr$general	SHD1 Summation 2 Pickup
S2D1PSHD15STStr$dirGeneral	SHD1 Summation 2 Direction (set to “unknown”)
S2D1PSHD15STStr$phsA	SHD1 Summation 2 Pickup A
S2D1PSHD15STStr$dirPhsA	SHD1 Summation 2 phase A Direction (set to “unknown”)
S2D1PSHD15STStr$phsB	SHD1 Summation 2 Pickup B
S2D1PSHD15STStr$dirPhsB	SHD1 Summation 2 phase B Direction (set to “unknown”)
S2D1PSHD15STStr$phsC	SHD1 Summation 2 Pickup C
S2D1PSHD15STStr$dirPhsC	SHD1 Summation 2 phase C Direction (set to “unknown”)
S2D1PSHD15STOp$general	SHD1 Summation 2 Trip
S2D1PSHD15STOp$phsA	SHD1 Summation 2 Trip A
S2D1PSHD15STOp$phsB	SHD1 Summation 2 Trip B
S2D1PSHD15STOp$phsC	SHD1 Summation 2 Trip C

S2D2PSHD16

This section defines data for the logical node S2D2PSHD16.

Data Name	Name
S2D2PSHD16STCntAlm$stVal	SHD2 Summation 2 Pickup Counter Alarm
S2D2PSHD16STStr$general	SHD2 Summation 2 Pickup
S2D2PSHD16STStr$dirGeneral	SHD2 Summation 2 Direction (set to unknown”)
S2D2PSHD16STStr$phsA	SHD2 Summation 2 Pickup
S2D2PSHD16STStr$dirPhsA	SHD2 Summation 2 phase A Direction (set to “unknown”)
S2D2PSHD16STStr$phsB	SHD2 Summation 2 Pickup B
S2D2PSHD16STStr$dirPhsB	SHD2 Summation 2 phase B Direction (set to “unknown”)

S2D2PSHD16STStr$phsC	SHD2 Summation 2 Pickup C
S2D2PSHD16STStr$dirPhsC	SHD2 Summation 2 phase C Direction (set to “unknown”)
S2D2PSHD16STOp$general	SHD2 Summation 2 Trip
S2D2PSHD16STOp$phsA	SHD2 Summation 2 Trip A
S2D2PSHD16STOp$phsB	SHD2 Summation 2 Trip B
S2D2PSHD16STOp$phsC	SHD2 Summation 2 Trip C

S3D1PSHD17

This section defines data for the logical node S3D1PSHD17.

Data Name	Name
S3D1PSHD17STCntAlm$stVal	SHD1 Summation 3 Pickup Counter Alarm
S3D1PSHD17STStr$dirGeneral	SHD1 Summation 3 Direction (set to unknown”)
S3D1PSHD17STStr$general	SHD1 Summation 3 Pickup
S3D1PSHD17STStr$phsA	SHD1 Summation 3 Pickup A
S3D1PSHD17STStr$dirPhsA	SHD1 Summation 3 phase A Direction (set to “unknown”)
S3D1PSHD17STStr$phsB	SHD1 Summation 3 Pickup B
S3D1PSHD17STStr$dirPhsB	SHD1 Summation 3 phase B Direction (set to “unknown”)
S3D1PSHD17STStr$phsC	SHD1 Summation 3 Pickup C
S3D1PSHD17STStr$dirPhsA	SHD1 Summation 3 phase C Direction (set to “unknown”)
S3D1PSHD17STOp$general	SHD1 Summation 3 Trip
S3D1PSHD17STOp$phsA	SHD1 Summation 3 Trip A
S3D1PSHD17STOp$phsB	SHD1 Summation 3 Trip B
S3D1PSHD17STOp$phsC	SHD1 Summation 3 Trip C

S3D2PSHD18

This section defines data for the logical node S3D2PSHD18.

Data Name	Name
S3D2PSHD18STCntAlm$stVal	SHD2 Summation 3 Pickup Counter Alarm
S3D2PSHD18STStr$general	SHD2 Summation 3 Direction (set to unknown”)
S3D2PSHD18STStr$general	SHD2 Summation 3 Pickup
S3D2PSHD18STStr$phsA	SHD2 Summation 3 Pickup A
S3D2PSHD18STStr$dirPhsA	SHD2 Summation 3 phase A Direction (set to “unknown”)
S3D2PSHD18STStr$phsB	SHD2 Summation 3 Pickup B
S3D2PSHD18STStr$dirPhsB	SHD2 Summation 3 phase B Direction (set to “unknown”)
S3D2PSHD18STStr$phsC	SHD2 Summation 3 Pickup C
S3D2PSHD18STStr$dirPhsC	SHD2 Summation 3 phase C Direction (set to “unknown”)
S3D2PSHD18STOp$general	SHD2 Summation 3 Trip
S3D2PSHD18STOp$phsA	SHD2 Summation 3 Trip A
S3D2PSHD18STOp$phsB	SHD2 Summation 3 Trip B
S3D2PSHD18STOp$phsC	SHD2 Summation 3 Trip C

S4D1PSHD19

This section defines data for the logical node S4D1PSHD19.

Data Name	Name
S4D1PSHD19STCntAlm$stVal	SHD4 Summation 1 Pickup Counter Alarm
S4D1PSHD19STStr$general	SHD4 Summation 1 Pickup
S4D1PSHD19STStr$dirGeneral	SHD4 Summation 1 Direction (set to unknown”)
S4D1PSHD19STStr$phsA	SHD4 Summation 1 Pickup A
S4D1PSHD19STStr$dirPhsA	SHD4 Summation 1 phase A Direction (set to “unknown”)
S4D1PSHD19STStr$phsB	SHD4 Summation 1 Pickup B

S4D1PSHD19STStr$dirPhsB	SHD4 Summation 1 phase B Direction (set to “unknown”)
S4D1PSHD19STStr$phsC	SHD4 Summation 1 Pickup C
S4D1PSHD19STStr$dirPhsC	SHD4 Summation 1 phase C Direction (set to “unknown”)
S4D1PSHD19STOp$general	SHD4 Summation 1 Trip
S4D1PSHD19STOp$phsA	SHD4 Summation 1 Trip A
S4D1PSHD19STOp$phsB	SHD4 Summation 1 Trip B
S4D1PSHD19STOp$phsC	SHD4 Summation 1 Trip C

S4D2PSHD20

This section defines data for the logical node S4D2PSHD20.

Data Name	Name
S4D2PSHD20STCntAlm$stVal	SHD4 Summation 2 Pickup Counter Alarm
S4D2PSHD20STStr$general	SHD4 Summation 2 Pickup
S4D2PSHD20STStr$dirGeneral	SHD4 Summation 2 Direction (set to unknown”)
S4D2PSHD20STStr$phsA	SHD4 Summation 2 Pickup A
S4D2PSHD20STStr$dirPhsA	SHD4 Summation 2 phase A Direction (set to “unknown”)
S4D2PSHD20STStr$phsB	SHD4 Summation 2 Pickup B
S4D2PSHD20STStr$dirPhsB	SHD4 Summation 2 phase B Direction (set to “unknown”)
S4D2PSHD20STStr$phsC	SHD4 Summation 2 Pickup C
S4D2PSHD20STStr$dirPhsC	SHD4 Summation 2 phase C Direction (set to “unknown”)
S4D2PSHD20STOp$general	SHD4 Summation 2 Trip
S4D2PSHD20STOp$phsA	SHD4 Summation 2 Trip A
S4D2PSHD20STOp$phsB	SHD4 Summation 2 Trip B
S4D2PSHD20STOp$phsC	SHD4 Summation 2 Trip C

Measurements Logical Device

Pwr1MMXU1

This section defines data for the logical node Pwr1MMXU1.

Data Name	Name
Pwr1MMXU1MXTotWmagf	Power 1: 3 phase Real Power
Pwr1MMXU1MXTotVArmagf	Power 1: 3 phase Reactive Power
Pwr1MMXU1MXTotVAmagf	Power 1: 3 phase Apparent Power
Pwr1MMXU1MXTotPFmagf	Power 1: 3 phase Power Factor
Pwr1MMXU1MXW$phsA$cValmagf	Power 1: A phase Real Power
Pwr1MMXU1MXW$phsB$cValmagf	Power 1: B phase Real Power
Pwr1MMXU1MXW$phsC$cValmagf	Power 1: C phase Real Power
Pwr1MMXU1MXVAr$phsA$cValmagf	Power 1: A phase Reactive Power
Pwr1MMXU1MXVAr$phsB$cValmagf	Power 1: B phase Reactive Power
Pwr1MMXU1MXVAr$phsC$cValmagf	Power 1: C phase Reactive Power
Pwr1MMXU1MXVA$phsA$cValmagf	Power 1: A phase Apparent Power
Pwr1MMXU1MXVA$phsB$cValmagf	Power 1: B phase Apparent Power
Pwr1MMXU1MXVA$phsC$cValmagf	Power 1: C phase Apparent Power
Pwr1MMXU1MXPF$phsA$cValmagf	Power 1: A phase Power Factor
Pwr1MMXU1MXPF$phsB$cValmagf	Power 1: B phase Power Factor
Pwr1MMXU1MXPF$phsC$cValmagf	Power 1: C phase Power Factor

Pwr2MMXU2

This section defines data for the logical node Pwr2MMXU2.

Data Name	Name
Pwr2MMXU2MXTotWmagf	Power 2: 3 phase Real Power
Pwr2MMXU2MXTotVArmagf	Power 2: 3 phase Reactive Power
Pwr2MMXU2MXTotVAmagf	Power 2: 3 phase Apparent Power
Pwr2MMXU2MXTotPFmagf	Power 2: 3 phase Power Factor
Pwr2MMXU2MXW$phsA$cValmagf	Power 2: A phase Real Power
Pwr2MMXU2MXW$phsB$cValmagf	Power 2: B phase Real Power

Pwr2MMXU2MXW$phsC$cValmagf	Power 2: C phase Real Power
Pwr2MMXU2MXVAr$phsA$cValmagf	Power 2: A phase Reactive Power
Pwr2MMXU2MXVAr$phsB$cValmagf	Power 2: B phase Reactive Power
Pwr2MMXU2MXVAr$phsC$cValmagf	Power 2: C phase Reactive Power
Pwr2MMXU2MXVA$phsA$cValmagf	Power 2: A phase Apparent Power
Pwr2MMXU2MXVA$phsB$cValmagf	Power 2: B phase Apparent Power
Pwr2MMXU2MXVA$phsC$cValmagf	Power 2: C phase Apparent Power
Pwr2MMXU2MXPF$phsA$cValmagf	Power 2: A phase Power Factor
Pwr2MMXU2MXPF$phsB$cValmagf	Power 2: B phase Power Factor
Pwr2MMXU2MXPF$phsC$cValmagf	Power 2: C phase Power Factor

MVMMXU3

This section defines data for the logical node MVMMXU3.

Data Name	Name
MVMMXU3MXPhV$phsA$cValmagf	Main Voltage phase A Magnitude
MVMMXU3MXPhV$phsA$cValangf	Main Voltage phase A Angle
MVMMXU3MXPhV$phsB$cValmagf	Main Voltage phase B Magnitude
MVMMXU3MXPhV$phsB$cValangf	Main Voltage phase B Angle
MVMMXU3MXPhV$phsC$cValmagf	Main Voltage phase C Magnitude
MVMMXU3MXPhV$phsC$cValangf	Main Voltage phase C Angle
MVMMXU3MXHzmagf	Main Voltage Fundamental Frequency

AVMMXU4

This section defines data for the logical node AVMMXU4.

Data Name	Name
AVMMXU4MXPhV$phsA$cValmagf	Auxiliary Voltage phase A Magnitude
AVMMXU4MXPhV$phsA$cValangf	Auxiliary Voltage phase A Angle
AVMMXU4MXPhV$phsB$cValmagf	Auxiliary Voltage phase B Magnitude
AVMMXU4MXPhV$phsB$cValangf	Auxiliary Voltage phase B Angle
AVMMXU4MXPhV$phsC$cValmagf	Auxiliary Voltage phase C Magnitude
AVMMXU4MXPhV$phsC$cValangf	Auxiliary Voltage phase C Angle

I1MMXU5

This section defines data for the logical node I1MMXU5.

Data Name	Name
I1MMXU5MXA$phsA$cValmagf	I1 phase A Magnitude
I1MMXU5MXA$phsA$cValangf	I1 phase A Angle
I1MMXU5MXA$phsB$cValmagf	I1 phase B Magnitude
I1MMXU5MXA$phsB$cValangf	I1 phase B Angle
I1MMXU5MXA$phsC$cValmagf	I1 phase C Magnitude
I1MMXU5MXA$phsC$cValangf	I1 phase C Angle

I2MMXU6

This section defines data for the logical node I2MMXU6.

Data Name	Name
I2MMXU6MXA$phsA$cValmagf	I2 phase A Magnitude
I2MMXU6MXA$phsA$cValangf	I2 phase A Angle
I2MMXU6MXA$phsB$cValmagf	I2 phase B Magnitude
I2MMXU6MXA$phsB$cValangf	I2 phase B Angle
I2MMXU6MXA$phsC$cValmagf	I2 phase C Magnitude
I2MMXU6MXA$phsC$cValangf	I2 phase C Angle

I3MMXU7

This section defines data for the logical node I3MMXU7.

Data Name	Name
I3MMXU7MXA$phsA$cValmagf	I3 phase A Magnitude
I3MMXU7MXA$phsA$cValangf	I3 phase A Angle
I3MMXU7MXA$phsB$cValmagf	I3 phase B Magnitude
I3MMXU7MXA$phsB$cValangf	I3 phase B Angle
I3MMXU7MXA$phsC$cValmagf	I3 phase C Magnitude
I3MMXU7MXA$phsC$cValangf	I3 phase C Angle

I4MMXU8

This section defines data for the logical node I4MMXU8.

Data Name	Name
I4MMXU8MXA$phsA$cValmagf	I4 phase A Magnitude
I4MMXU8MXA$phsA$cValangf	I4 phase A Angle
I4MMXU8MXA$phsB$cValmagf	I4 phase B Magnitude
I4MMXU8MXA$phsB$cValangf	I4 phase B Angle
I4MMXU8MXA$phsC$cValmagf	I4 phase C Magnitude
I4MMXU8MXA$phsC$cValangf	I4 phase C Angle

Sum1MMXU9

This section defines data for the logical node Sum1MMXU9.

Data Name	Name
S1MMXU9MXA$phsA$cValmagf	Summation 1 phase A Magnitude
S1MMXU9MXA$phsA$cValangf	Summation 1 phase A Angle
S1MMXU9MXA$phsB$cValmagf	Summation 1 phase B Magnitude
S1MMXU9MXA$phsB$cValangf	Summation 1 phase B Angle
S1MMXU9MXA$phsC$cValmagf	Summation 1 phase C Magnitude
S1MMXU9MXA$phsC$cValangf	Summation 1 phase C Angle

Sum2MMXU10

This section defines data for the logical node Sum2MMXU10.

Data Name	Name
S2MMXU10MXA$phsA$cValmagf	Summation 2 phase A Magnitude
S2MMXU10MXA$phsA$cValangf	Summation 2 phase A Angle
S2MMXU10MXA$phsB$cValmagf	Summation 2 phase B Magnitude
S2MMXU10MXA$phsB$cValangf	Summation 2 phase B Angle
S2MMXU10MXA$phsC$cValmagf	Summation 2 phase C Magnitude
S2MMXU10MXA$phsC$cValangf	Summation 2 phase C Angle

Sum3MMXU11

This section defines data for the logical node Sum3MMXU11.

Data attribute Name	Name
S3MMXU11MXA$phsA$cValmagf	Summation 3 phase A Magnitude
S3MMXU11MXA$phsA$cValangf	Summation 3 phase A Angle
S3MMXU11MXA$phsB$cValmagf	Summation 3 phase B Magnitude
S3MMXU11MXA$phsB$cValangf	Summation 3 phase B Angle
S3MMXU11MXA$phsC$cValmagf	Summation 3 phase C Magnitude
S3MMXU11MXA$phsC$cValangf	Summation 3 phase C Angle

Sum4MMXU12

This section defines data for the logical node Sum4MMXU12.

Data Name	Name
S4MMXU12MXA$phsA$cValmagf	Summation 4 phase A Magnitude
S4MMXU12MXA$phsA$cValangf	Summation 4 phase A Angle
S4MMXU12MXA$phsB$cValmagf	Summation 4 phase B Magnitude
S4MMXU12MXA$phsB$cValangf	Summation 4 phase B Angle
S4MMXU12MXA$phsC$cValmagf	Summation 4 phase C Magnitude
S4MMXU12MXA$phsC$cValangf	Summation 4 phase C Angle

MVSHMMXU13

This section defines data for the logical node MVSHMMXU13.

Data Name	Name
MVSHMMXU13MXTotSHD$phsA$cValmagf	Main Voltage A TSHD
MVSHMMXU13MXTotSHD$phsB$cValmagf	Main Voltage B TSHD
MVSHMMXU13MXTotSHD$phsC$cValmagf	Main Voltage C TSHD
MVSHMMXU13MXSHDPhV1$phsB$cValmagf	Main Voltage phase A Subharmonic Magnitude 1st
MVSHMMXU13MXSHDPhV1$phsA$cHzmagf	Main Voltage phase A Subharmonic Frequency 1st
MVSHMMXU13MXSHDPhV1$phsB$cValmagf	Main Voltage phase B Subharmonic Magnitude 1st
MVSHMMXU13MXSHDPhV1$phsB$cHzmagf	Main Voltage phase B Subharmonic Frequency 1st
MVSHMMXU13MXSHDPhV1$phsC$cValmagf	Main Voltage phase C Subharmonic Magnitude 1st
MVSHMMXU13MXSHDPhV1$phsC$cHzmagf	Main Voltage phase C Subharmonic Frequency 1st
MVSHMMXU13MXSHDPhV2$phsA$cValmagf	Main Voltage phase A Subharmonic Magnitude 2nd
MVSHMMXU13MXSHDPhV2$phsA$cHzmagf	Main Voltage phase A Subharmonic Frequency 2nd
MVSHMMXU13MXSHDPhV2$phsB$cValmagf	Main Voltage phase B Subharmonic Magnitude 2nd
MVSHMMXU13MXSHDPhV2$phsB$cHzmagf	Main Voltage phase B Subharmonic Frequency 2nd
MVSHMMXU13MXSHDPhV2$phsC$cValmagf	Main Voltage phase C Subharmonic Magnitude 2nd
MVSHMMXU13MXSHDPhV2$phsC$cHzmagf	Main Voltage phase C Subharmonic Frequency 2nd
MVSHMMXU13MXSHDPhV3$phsA$cValmagf	Main Voltage phase A Subharmonic Magnitude 3rd

MVSHMMXU13MXSHDPhV3$phsA$cHzmagf	Main Voltage phase A Subharmonic Frequency 3rd
MVSHMMXU13MXSHDPhV3$phsB$cValmagf	Main Voltage phase B Subharmonic Magnitude 3rd
MVSHMMXU13MXSHDPhV3$phsB$cHzmagf	Main Voltage phase B Subharmonic Frequency 3rd
MVSHMMXU13MXSHDPhV3$phsC$cValmagf	Main Voltage phase C Subharmonic Magnitude 3rd
MVSHMMXU13MXSHDPhV3$phsC$cHzmagf	Main Voltage phase C Subharmonic Frequency 3rd
MVSHMMXU13MXSHDPhV4$phsA$cValmagf	Main Voltage phase A Subharmonic Magnitude 4th
MVSHMMXU13MXSHDPhV4$phsA$cHzmagf	Main Voltage phase A Subharmonic Frequency 4th
MVSHMMXU13MXSHDPhV4$phsB$cValmagf	Main Voltage phase B Subharmonic Magnitude 4th
MVSHMMXU13MXSHDPhV4$phsB$cHzmagf	Main Voltage phase B Subharmonic Frequency 4th
MVSHMMXU13MXSHDPhV4$phsC$cValmagf	Main Voltage phase C Subharmonic Magnitude 4th
MVSHMMXU13MXSHDPhV4$phsC$cHzmagf	Main Voltage phase C Subharmonic Frequency 4th
MVSHMMXU13MXSHDPhV5$phsA$cValmagf	Main Voltage phase A Subharmonic Magnitude 5th
MVSHMMXU13MXSHDPhV5$phsA$cHzmagf	Main Voltage phase A Subharmonic Frequency 5th
MVSHMMXU13MXSHDPhV5$phsB$cValmagf	Main Voltage phase B Subharmonic Magnitude 5th
MVSHMMXU13MXSHDPhV5$phsB$cHzmagf	Main Voltage phase B Subharmonic Frequency 5th
MVSHMMXU13MXSHDPhV5$phsC$cValmagf	Main Voltage phase C Subharmonic Magnitude 5th
MVSHMMXU13MXSHDPhV5$phsC$cHzmagf	Main Voltage Phase C Subharmonic Frequency 5th

AVSHMMXU14

This section defines data for the logical node AVSHMMXU14.

Data Name	Name
AVSHMMXU14MXTotSHD$phsA$cValmagf	Auxiliary Voltage phase A TSHD
AVSHMMXU14MXTotSHD$phsB$cValmagf	Auxiliary Voltage phase B TSHD
AVSHMMXU14MXTotSHD$phsC$cValmagf	Auxiliary Voltage phase C TSHD
AVSHMMXU14MXSHDPhV1$phsB$cValmagf	Auxiliary Voltage phase A Subharmonic Magnitude 1st
AVSHMMXU14MXSHDPhV1$phsA$cHzmagf	Auxiliary Voltage phase A Subharmonic Frequency 1st
AVSHMMXU14MXSHDPhV1$phsB$cValmagf	Auxiliary Voltage phase B Subharmonic Magnitude 1st
AVSHMMXU14MXSHDPhV1$phsB$cHzmagf	Auxiliary Voltage phase B Subharmonic Frequency 1st
AVSHMMXU14MXSHDPhV1$phsC$cValmagf	Auxiliary Voltage phase C Subharmonic Magnitude 1st
AVSHMMXU14MXSHDPhV1$phsC$cHzmagf	Auxiliary Voltage phase C Subharmonic Frequency 1st

AVSHMMXU14MXSHDPhV2$phsA$cValmagf	Auxiliary Voltage phase A Subharmonic Magnitude 2nd
AVSHMMXU14MXSHDPhV2$phsA$cHzmagf	Auxiliary Voltage phase A Subharmonic Frequency 2nd
AVSHMMXU14MXSHDPhV2$phsB$cValmagf	Auxiliary Voltage phase B Subharmonic Magnitude 2nd
AVSHMMXU14MXSHDPhV2$phsB$cHzmagf	Auxiliary Voltage phase B Subharmonic Frequency 2nd
AVSHMMXU14MXSHDPhV2$phsC$cValmagf	Auxiliary Voltage phase C Subharmonic Magnitude 2nd
AVSHMMXU14MXSHDPhV2$phsC$cHzmagf	Auxiliary Voltage phase C Subharmonic Frequency 2nd
AVSHMMXU14MXSHDPhV3$phsA$cValmagf	Auxiliary Voltage phase A Subharmonic Magnitude 3rd
AVSHMMXU14MXSHDPhV3$phsA$cHzmagf	Auxiliary Voltage phase A Subharmonic Frequency 3rd
AVSHMMXU14MXSHDPhV3$phsB$cValmagf	Auxiliary Voltage phase B Subharmonic Magnitude 3rd
AVSHMMXU14MXSHDPhV3$phsB$cHzmagf	Auxiliary Voltage phase B Subharmonic Frequency 3rd
AVSHMMXU14MXSHDPhV3$phsC$cValmagf	Auxiliary Voltage phase C Subharmonic Magnitude 3rd
AVSHMMXU14MXSHDPhV3$phsC$cHzmagf	Auxiliary Voltage phase C Subharmonic Frequency 3rd
AVSHMMXU14MXSHDPhV4$phsA$cValmagf	Auxiliary Voltage phase A Subharmonic Magnitude 4th
AVSHMMXU14MXSHDPhV4$phsA$cHzmagf	Auxiliary Voltage phase A Subharmonic Frequency 4th
AVSHMMXU14MXSHDPhV4$phsB$cValmagf	Auxiliary Voltage phase B Subharmonic Magnitude 4th
AVSHMMXU14MXSHDPhV4$phsB$cHzmagf	Auxiliary Voltage phase B Subharmonic Frequency 4th
AVSHMMXU14MXSHDPhV4$phsC$cValmagf	Auxiliary Voltage phase C Subharmonic Magnitude 4th
AVSHMMXU14MXSHDPhV4$phsC$cHzmagf	Auxiliary Voltage phase C Subharmonic Frequency 4th
AVSHMMXU14MXSHDPhV5$phsA$cValmagf	Auxiliary Voltage phase A Subharmonic Magnitude 5th
AVSHMMXU14MXSHDPhV5$phsA$cHzmagf	Auxiliary Voltage phase A Subharmonic Frequency 5th
AVSHMMXU14MXSHDPhV5$phsB$cValmagf	Auxiliary Voltage phase B Subharmonic Magnitude 5th
AVSHMMXU14MXSHDPhV5$phsB$cHzmagf	Auxiliary Voltage phase B Subharmonic Frequency 5th
AVSHMMXU14MXSHDPhV5$phsC$cValmagf	Auxiliary Voltage phase C Subharmonic Magnitude 5th
AVSHMMXU14MXSHDPhV5$phsC$cHzmagf	Auxiliary Voltage phase C Subharmonic Frequency 5th

I1SHMMXU15

This section defines data for the logical node I1SHMMXU15.

Data Name	Name
I1SHMMXU15MXTotSHD$phsA$cValmagf	Current 1 phase A TSHD
I1SHMMXU15MXTotSHD$phsB$cValmagf	Current 1 phase B TSHD
I1SHMMXU15MXTotSHD$phsC$cValmagf	Current 1 phase C TSHD
I1SHMMXU15MXSHDA1$phsA$cValmagf	Current 1 phase A Subharmonic Magnitude 1st
I1SHMMXU15MXSHDA1$phsA$cHzmagf	Current 1 phase A Subharmonic Frequency 1st
I1SHMMXU15MXSHDA1$phsB$cValmagf	Current 1 phase B Subharmonic Magnitude 1st
I1SHMMXU15MXSHDA1$phsB$cHzmagf	Current 1 phase B Subharmonic Frequency 1st
I1SHMMXU15MXSHDA1$phsC$cValmagf	Current 1 phase C Subharmonic Magnitude 1st
I1SHMMXU15MXSHDA1$phsC$cHzmagf	Current 1 phase C Subharmonic Frequency 1st
I1SHMMXU15MXSHDA2$phsA$cValmagf	Current 1 phase A Subharmonic Magnitude 2nd
I1SHMMXU15MXSHDA2$phsA$cHzmagf	Current 1 phase A Subharmonic Frequency 2nd
I1SHMMXU15MXSHDA2$phsB$cValmagf	Current 1 phase B Subharmonic Magnitude 2nd
I1SHMMXU15MXSHDA2$phsB$cHzmagf	Current 1 phase B Subharmonic Frequency 2nd
I1SHMMXU15MXSHDA2$phsC$cValmagf	Current 1 phase C Subharmonic Magnitude 2nd
I1SHMMXU15MXSHDA2$phsC$cHzmagf	Current 1 phase C Subharmonic Frequency 2nd
I1SHMMXU15MXSHDA3$phsA$cValmagf	Current 1 phase A Subharmonic Magnitude 3rd
I1SHMMXU15MXSHDA3$phsA$cHzmagf	Current 1 phase A Subharmonic Frequency 3rd
I1SHMMXU15MXSHDA3$phsB$cValmagf	Current 1 phase B Subharmonic Magnitude 3rd
I1SHMMXU15MXSHDA3$phsB$cHzmagf	Current 1 phase B Subharmonic Frequency 3rd
I1SHMMXU15MXSHDA3$phsC$cValmagf	Current 1 phase C Subharmonic Magnitude 3rd
I1SHMMXU15MXSHDA3$phsC$cHzmagf	Current 1 phase C Subharmonic Frequency 3rd
I1SHMMXU15MXSHDA4$phsA$cValmagf	Current 1 phase A Subharmonic Magnitude 4th
I1SHMMXU15MXSHDA4$phsA$cHzmagf	Current 1 phase A Subharmonic Frequency 4th
I1SHMMXU15MXSHDA4$phsB$cValmagf	Current 1 phase B Subharmonic Magnitude 4th
I1SHMMXU15MXSHDA4$phsB$cHzmagf	Current 1 phase B Subharmonic Frequency 4th
I1SHMMXU15MXSHDA4$phsC$cValmagf	Current 1 phase C Subharmonic Magnitude 4th
I1SHMMXU15MXSHDA4$phsC$cHzmagf	Current 1 phase C Subharmonic Frequency 4th
I1SHMMXU15MXSHDA5$phsA$cValmagf	Current 1 phase A Subharmonic Magnitude 5th

I1SHMMXU15MXSHDA5$phsA$cHzmagf	Current 1 phase A Subharmonic Frequency 5th
I1SHMMXU15MXSHDA5$phsB$cValmagf	Current 1 phase B Subharmonic Magnitude 5th
I1SHMMXU15MXSHDA5$phsB$cHzmagf	Current 1 phase B Subharmonic Frequency 5th
I1SHMMXU15MXSHDA5$phsC$cValmagf	Current 1 phase C Subharmonic Magnitude 5th
I1SHMMXU15MXSHDA5$phsC$cHzmagf	Current 1 phase C Subharmonic Frequency 5th

I2SHMMXU16

This section defines data for the logical node I2SHMMXU16.

Data Name	Name
I2SHMMXU16MXTotSHD$phsA$cValmagf	Current 2 phase A TSHD
I2SHMMXU16MXTotSHD$phsB$cValmagf	Current 2 phase B TSHD
I2SHMMXU16MXTotSHD$phsC$cValmagf	Current 2 phase C TSHD
I2SHMMXU16MXSHDA1$phsA$cValmagf	Current 2 phase A Subharmonic Magnitude 1st
I2SHMMXU16MXSHDA1$phsA$cHzmagf	Current 2 phase A Subharmonic Frequency 1st
I2SHMMXU16MXSHDA1$phsB$cValmagf	Current 2 phase B Subharmonic Magnitude 1st
I2SHMMXU16MXSHDA1$phsB$cHzmagf	Current 2 phase B Subharmonic Frequency 1st
I2SHMMXU16MXSHDA1$phsC$cValmagf	Current 2 phase C Subharmonic Magnitude 1st
I2SHMMXU16MXSHDA1$phsC$cHzmagf	Current 2 phase C Subharmonic Frequency 1st
I2SHMMXU16MXSHDA2$phsA$cValmagf	Current 2 phase A Subharmonic Magnitude 2nd
I2SHMMXU16MXSHDA2$phsA$cHzmagf	Current 2 phase A Subharmonic Frequency 2nd
I2SHMMXU16MXSHDA2$phsB$cValmagf	Current 2 phase B Subharmonic Magnitude 2nd
I2SHMMXU16MXSHDA2$phsB$cHzmagf	Current 2 phase B Subharmonic Frequency 2nd
I2SHMMXU16MXSHDA2$phsC$cValmagf	Current 2 phase C Subharmonic Magnitude 2nd
I2SHMMXU16MXSHDA2$phsC$cHzmagf	Current 2 phase C Subharmonic Frequency 2nd
I2SHMMXU16MXSHDA3$phsA$cValmagf	Current 2 phase A Subharmonic Magnitude 3rd
I2SHMMXU16MXSHDA3$phsA$cHzmagf	Current 2 phase A Subharmonic Frequency 3rd
I2SHMMXU16MXSHDA3$phsB$cValmagf	Current 2 phase B Subharmonic Magnitude 3rd
I2SHMMXU16MXSHDA3$phsB$cHzmagf	Current 2 phase B Subharmonic Frequency 3rd
I2SHMMXU16MXSHDA3$phsC$cValmagf	Current 2 phase C Subharmonic Magnitude 3rd
I2SHMMXU16MXSHDA3$phsC$cHzmagf	Current 2 phase C Subharmonic Frequency 3rd

I2SHMMXU16MXSHDA4$phsA$cValmagf	Current 2 phase A Subharmonic Magnitude 4th
I2SHMMXU16MXSHDA4$phsA$cHzmagf	Current 2 phase A Subharmonic Frequency 4th
I2SHMMXU16MXSHDA4$phsB$cValmagf	Current 2 phase B Subharmonic Magnitude 4th
I2SHMMXU16MXSHDA4$phsB$cHzmagf	Current 2 phase B Subharmonic Frequency 4th
I2SHMMXU16MXSHDA4$phsC$cValmagf	Current 2 phase C Subharmonic Magnitude 4th
I2SHMMXU16MXSHDA4$phsC$cHzmagf	Current 2 phase C Subharmonic Frequency 4th
I2SHMMXU16MXSHDA5$phsA$cValmagf	Current 2 phase A Subharmonic Magnitude 5th
I2SHMMXU16MXSHDA5$phsA$cHzmagf	Current 2 phase A Subharmonic Frequency 5th
I2SHMMXU16MXSHDA5$phsB$cValmagf	Current 2 phase B Subharmonic Magnitude 5th
I2SHMMXU16MXSHDA5$phsB$cHzmagf	Current 2 phase B Subharmonic Frequency 5th
I2SHMMXU16MXSHDA5$phsC$cValmagf	Current 2 phase C Subharmonic Magnitude 5th
I2SHMMXU16MXSHDA5$phsC$cHzmagf	Current 2 phase C Subharmonic Frequency 5th

I3SHMMXU17

This section defines data for the logical node I3SHMMXU17.

Data Name	Name
I3SHMMXU17MXTotSHD$phsA$cValmagf	Current 3 phase A TSHD
I3SHMMXU17MXTotSHD$phsB$cValmagf	Current 3 phase B TSHD
I3SHMMXU17MXTotSHD$phsC$cValmagf	Current 3 phase C TSHD
I3SHMMXU17MXSHDA1$phsA$cValmagf	Current 3 phase A Subharmonic Magnitude 1st
I3SHMMXU17MXSHDA1$phsA$cHzmagf	Current 3 phase A Subharmonic Frequency 1st
I3SHMMXU17MXSHDA1$phsB$cValmagf	Current 3 phase B Subharmonic Magnitude 1st
I3SHMMXU17MXSHDA1$phsB$cHzmagf	Current 3 phase B Subharmonic Frequency 1st
I3SHMMXU17MXSHDA1$phsC$cValmagf	Current 3 phase C Subharmonic Magnitude 1st
I3SHMMXU17MXSHDA1$phsC$cHzmagf	Current 3 phase C Subharmonic Frequency 1st
I3SHMMXU17MXSHDA2$phsA$cValmagf	Current 3 phase A Subharmonic Magnitude 2nd
I3SHMMXU17MXSHDA2$phsA$cHzmagf	Current 3 phase A Subharmonic Frequency 2nd
I3SHMMXU17MXSHDA2$phsB$cValmagf	Current 3 phase B Subharmonic Magnitude 2nd
I3SHMMXU17MXSHDA2$phsB$cHzmagf	Current 3 phase B Subharmonic Frequency 2nd
I3SHMMXU17MXSHDA2$phsC$cValmagf	Current 3 phase C Subharmonic Magnitude 2nd

I3SHMMXU17MXSHDA2$phsC$cHzmagf	Current 3 phase C Subharmonic Frequency 2nd
I3SHMMXU17MXSHDA3$phsA$cValmagf	Current 3 phase A Subharmonic Magnitude 3rd
I3SHMMXU17MXSHDA3$phsA$cHzmagf	Current 3 phase A Subharmonic Frequency 3rd
I3SHMMXU17MXSHDA3$phsB$cValmagf	Current 3 phase B Subharmonic Magnitude 3rd
I3SHMMXU17MXSHDA3$phsB$cHzmagf	Current 3 phase B Subharmonic Frequency 3rd
I3SHMMXU17MXSHDA3$phsC$cValmagf	Current 3 phase C Subharmonic Magnitude 3rd
I3SHMMXU17MXSHDA3$phsC$cHzmagf	Current 3 phase C Subharmonic Frequency 3rd
I3SHMMXU17MXSHDA4$phsA$cValmagf	Current 3 phase A Subharmonic Magnitude 4th
I3SHMMXU17MXSHDA4$phsA$cHzmagf	Current 3 phase A Subharmonic Frequency 4th
I3SHMMXU17MXSHDA4$phsB$cValmagf	Current 3 phase B Subharmonic Magnitude 4th
I3SHMMXU17MXSHDA4$phsB$cHzmagf	Current 3 phase B Subharmonic Frequency 4th
I3SHMMXU17MXSHDA4$phsC$cValmagf	Current 3 phase C Subharmonic Magnitude 4th
I3SHMMXU17MXSHDA4$phsC$cHzmagf	Current 3 phase C Subharmonic Frequency 4th
I3SHMMXU17MXSHDA5$phsA$cValmagf	Current 3 phase A Subharmonic Magnitude 5th
I3SHMMXU17MXSHDA5$phsA$cHzmagf	Current 3 phase A Subharmonic Frequency 5th
I3SHMMXU17MXSHDA5$phsB$cValmagf	Current 3 phase B Subharmonic Magnitude 5th
I3SHMMXU17MXSHDA5$phsB$cHzmagf	Current 3 phase B Subharmonic Frequency 5th
I3SHMMXU17MXSHDA5$phsC$cValmagf	Current 3 phase C Subharmonic Magnitude 5th
I3SHMMXU17MXSHDA5$phsC$cHzmagf	Current 3 phase C Subharmonic Frequency 5th

I4SHMMXU18

This section defines data for the logical node I4SHMMXU18.

Data Name	Name
I4SHMMXU18MXTotSHD$phsA$cValmagf	Current 4 phase A TSHD
I4SHMMXU18MXTotSHD$phsB$cValmagf	Current 4 phase B TSHD
I4SHMMXU18MXTotSHD$phsC$cValmagf	Current 4 phase C TSHD
I4SHMMXU18MXSHDA1$phsA$cValmagf	Current 4 phase A Subharmonic Magnitude 1st
I4SHMMXU18MXSHDA1$phsA$cHzmagf	Current 4 phase A Subharmonic Frequency 1st
I4SHMMXU18MXSHDA1$phsB$cValmagf	Current 4 phase B Subharmonic Magnitude 1st

I4SHMMXU18MXSHDA1$phsB$cHzmagf	Current 4 phase B Subharmonic Frequency 1st
I4SHMMXU18MXSHDA1$phsC$cValmagf	Current 4 phase C Subharmonic Magnitude 1st
I4SHMMXU18MXSHDA1$phsC$cHzmagf	Current 4 phase C Subharmonic Frequency 1st
I4SHMMXU18MXSHDA2$phsA$cValmagf	Current 4 phase A Subharmonic Magnitude 2nd
I4SHMMXU18MXSHDA2$phsA$cHzmagf	Current 4 phase A Subharmonic Frequency 2nd
I4SHMMXU18MXSHDA2$phsB$cValmagf	Current 4 phase B Subharmonic Magnitude 2nd
I4SHMMXU18MXSHDA2$phsB$cHzmagf	Current 4 phase B Subharmonic Frequency 2nd
I4SHMMXU18MXSHDA2$phsC$cValmagf	Current 4 phase C Subharmonic Magnitude 2nd
I4SHMMXU18MXSHDA2$phsC$cHzmagf	Current 4 phase C Subharmonic Frequency 2nd
I4SHMMXU18MXSHDA3$phsA$cValmagf	Current 4 phase A Subharmonic Magnitude 3rd
I4SHMMXU18MXSHDA3$phsA$cHzmagf	Current 4 phase A Subharmonic Frequency 3rd
I4SHMMXU18MXSHDA3$phsB$cValmagf	Current 4 phase B Subharmonic Magnitude 3rd
I4SHMMXU18MXSHDA3$phsB$cHzmagf	Current 4 phase B Subharmonic Frequency 3rd
I4SHMMXU18MXSHDA3$phsC$cValmagf	Current 4 phase C Subharmonic Magnitude 3rd
I4SHMMXU18MXSHDA3$phsC$cHzmagf	Current 4 phase C Subharmonic Frequency 3rd
I4SHMMXU18MXSHDA4$phsA$cValmagf	Current 4 phase A Subharmonic Magnitude 4th
I4SHMMXU18MXSHDA4$phsA$cHzmagf	Current 4 phase A Subharmonic Frequency 4th
I4SHMMXU18MXSHDA4$phsB$cValmagf	Current 4 phase B Subharmonic Magnitude 4th
I4SHMMXU18MXSHDA4$phsB$cHzmagf	Current 4 phase B Subharmonic Frequency 4th
I4SHMMXU18MXSHDA4$phsC$cValmagf	Current 4 phase C Subharmonic Magnitude 4th
I4SHMMXU18MXSHDA4$phsC$cHzmagf	Current 4 phase C Subharmonic Frequency 4th
I4SHMMXU18MXSHDA5$phsA$cValmagf	Current 4 phase A Subharmonic Magnitude 5th
I4SHMMXU18MXSHDA5$phsA$cHzmagf	Current 4 phase A Subharmonic Frequency 5th
I4SHMMXU18MXSHDA5$phsB$cValmagf	Current 4 phase B Subharmonic Magnitude 5th
I4SHMMXU18MXSHDA5$phsB$cHzmagf	Current 4 phase B Subharmonic Frequency 5th
I4SHMMXU18MXSHDA5$phsC$cValmagf	Current 4 phase C Subharmonic Magnitude 5th
I4SHMMXU18MXSHDA5$phsC$cHzmagf	Current 4 phase C Subharmonic Frequency 5th

S1SHMMXU19

This section defines data for the logical node S1SHMMXU19.

Data Name	Name
S1SHMMXU19MXTotSHD$phsA$cValmagf	Summation 1 phase A TSHD
S1SHMMXU19MXTotSHD$phsB$cValmagf	Summation 1 phase B TSHD
S1SHMMXU19MXTotSHD$phsC$cValmagf	Summation 1 phase C TSHD
S1SHMMXU19MXSHDA1$phsA$cValmagf	Summation 1 phase A Subharmonic Magnitude 1st
S1SHMMXU19MXSHDA1$phsA$cHzmagf	Summation 1 phase A Subharmonic Frequency 1st
S1SHMMXU19MXSHDA1$phsB$cValmagf	Summation 1 phase B Subharmonic Magnitude 1st
S1SHMMXU19MXSHDA1$phsB$cHzmagf	Summation 1 phase B Subharmonic Frequency 1st
S1SHMMXU19MXSHDA1$phsC$cValmagf	Summation 1 phase C Subharmonic Magnitude 1st
S1SHMMXU19MXSHDA1$phsC$cHzmagf	Summation 1 phase C Subharmonic Frequency 1st
S1SHMMXU19MXSHDA2$phsA$cValmagf	Summation 1 phase A Subharmonic Magnitude 2nd
S1SHMMXU19MXSHDA2$phsA$cHzmagf	Summation 1 phase A Subharmonic Frequency 2nd
S1SHMMXU19MXSHDA2$phsB$cValmagf	Summation 1 phase B Subharmonic Magnitude 2nd
S1SHMMXU19MXSHDA2$phsB$cHzmagf	Summation 1 phase B Subharmonic Frequency 2nd
S1SHMMXU19MXSHDA2$phsC$cValmagf	Summation 1 phase C Subharmonic Magnitude 2nd
S1SHMMXU19MXSHDA2$phsC$cHzmagf	Summation 1 phase C Subharmonic Frequency 2nd
S1SHMMXU19MXSHDA3$phsA$cValmagf	Summation 1 phase A Subharmonic Magnitude 3rd
S1SHMMXU19MXSHDA3$phsA$cHzmagf	Summation 1 phase A Subharmonic Frequency 3rd
S1SHMMXU19MXSHDA3$phsB$cValmagf	Summation 1 phase B Subharmonic Magnitude 3rd
S1SHMMXU19MXSHDA3$phsB$cHzmagf	Summation 1 phase B Subharmonic Frequency 3rd
S1SHMMXU19MXSHDA3$phsC$cValmagf	Summation 1 phase C Subharmonic Magnitude 3rd
S1SHMMXU19MXSHDA3$phsC$cHzmagf	Summation 1 phase C Subharmonic Frequency 3rd
S1SHMMXU19MXSHDA4$phsA$cValmagf	Summation 1 phase A Subharmonic Magnitude 4th
S1SHMMXU19MXSHDA4$phsA$cHzmagf	Summation 1 phase A Subharmonic Frequency 4th
S1SHMMXU19MXSHDA4$phsB$cValmagf	Summation 1 phase B Subharmonic Magnitude 4th
S1SHMMXU19MXSHDA4$phsB$cHzmagf	Summation 1 phase B Subharmonic Frequency 4th
S1SHMMXU19MXSHDA4$phsC$cValmagf	Summation 1 phase C Subharmonic Magnitude 4th
S1SHMMXU19MXSHDA4$phsC$cHzmagf	Summation 1 phase C Subharmonic Frequency 4th
S1SHMMXU19MXSHDA5$phsA$cValmagf	Summation 1 phase A Subharmonic Magnitude 5th

S1SHMMXU19MXSHDA5$phsA$cHzmagf	Summation 1 phase A Subharmonic Frequency 5th
S1SHMMXU19MXSHDA5$phsB$cValmagf	Summation 1 phase B Subharmonic Magnitude 5th
S1SHMMXU19MXSHDA5$phsB$cHzmagf	Summation 1 phase B Subharmonic Frequency 5th
S1SHMMXU19MXSHDA5$phsC$cValmagf	Summation 1 phase C Subharmonic Magnitude 5th
S1SHMMXU19MXSHDA5$phsC$cHzmagf	Summation 1 phase C Subharmonic Frequency 5th

S2SHMMXU20

This section defines data for the logical node S2SHMMXU20.

Data Name	Name
S2SHMMXU20MXTotSHD$phsA$cValmagf	Summation 2 phase A TSHD
S2SHMMXU20MXTotSHD$phsB$cValmagf	Summation 2 phase B TSHD
S2SHMMXU20MXTotSHD$phsC$cValmagf	Summation 2 phase C TSHD
S2SHMMXU20MXSHDA1$phsA$cValmagf	Summation 2 phase A Subharmonic Magnitude 1st
S2SHMMXU20MXSHDA1$phsA$cHzmagf	Summation 2 phase A Subharmonic Frequency 1st
S2SHMMXU20MXSHDA1$phsB$cValmagf	Summation 2 phase B Subharmonic Magnitude 1st
S2SHMMXU20MXSHDA1$phsB$cHzmagf	Summation 2 phase B Subharmonic Frequency 1st
S2SHMMXU20MXSHDA1$phsC$cValmagf	Summation 2 phase C Subharmonic Magnitude 1st
S2SHMMXU20MXSHDA1$phsC$cHzmagf	Summation 2 phase C Subharmonic Frequency 1st
S2SHMMXU20MXSHDA2$phsA$cValmagf	Summation 2 phase A Subharmonic Magnitude 2nd
S2SHMMXU20MXSHDA2$phsA$cHzmagf	Summation 2 phase A Subharmonic Frequency 2nd
S2SHMMXU20MXSHDA2$phsB$cValmagf	Summation 2 phase B Subharmonic Magnitude 2nd
S2SHMMXU20MXSHDA2$phsB$cHzmagf	Summation 2 phase B Subharmonic Frequency 2nd
S2SHMMXU20MXSHDA2$phsC$cValmagf	Summation 2 phase C Subharmonic Magnitude 2nd
S2SHMMXU20MXSHDA2$phsC$cHzmagf	Summation 2 phase C Subharmonic Frequency 2nd
S2SHMMXU20MXSHDA3$phsA$cValmagf	Summation 2 phase A Subharmonic Magnitude 3rd
S2SHMMXU20MXSHDA3$phsA$cHzmagf	Summation 2 phase A Subharmonic Frequency 3rd
S2SHMMXU20MXSHDA3$phsB$cValmagf	Summation 2 phase B Subharmonic Magnitude 3rd
S2SHMMXU20MXSHDA3$phsB$cHzmagf	Summation 2 phase B Subharmonic Frequency 3rd
S2SHMMXU20MXSHDA3$phsC$cValmagf	Summation 2 phase C Subharmonic Magnitude 3rd
S2SHMMXU20MXSHDA3$phsC$cHzmagf	Summation 2 phase C Subharmonic Frequency 3rd

S2SHMMXU20MXSHDA4$phsA$cValmagf	Summation 2 phase A Subharmonic Magnitude 4th
S2SHMMXU20MXSHDA4$phsA$cHzmagf	Summation 2 phase A Subharmonic Frequency 4th
S2SHMMXU20MXSHDA4$phsB$cValmagf	Summation 2 phase B Subharmonic Magnitude 4th
S2SHMMXU20MXSHDA4$phsB$cHzmagf	Summation 2 phase B Subharmonic Frequency 4th
S2SHMMXU20MXSHDA4$phsC$cValmagf	Summation 2 phase C Subharmonic Magnitude 4th
S2SHMMXU20MXSHDA4$phsC$cHzmagf	Summation 2 phase C Subharmonic Frequency 4th
S2SHMMXU20MXSHDA5$phsA$cValmagf	Summation 2 phase A Subharmonic Magnitude 5th
S2SHMMXU20MXSHDA5$phsA$cHzmagf	Summation 2 phase A Subharmonic Frequency 5th
S2SHMMXU20MXSHDA5$phsB$cValmagf	Summation 2 phase B Subharmonic Magnitude 5th
S2SHMMXU20MXSHDA5$phsB$cHzmagf	Summation 2 phase B Subharmonic Frequency 5th
S2SHMMXU20MXSHDA5$phsC$cValmagf	Summation 2 phase C Subharmonic Magnitude 5th
S2SHMMXU20MXSHDA5$phsC$cHzmagf	Summation 2 phase C Subharmonic Frequency 5th

S3SHMMXU21

This section defines data for the logical node S3SHMMXU21.

Data Name	Name
S3SHMMXU21MXTotSHD$phsA$cValmagf	Summation 3 phase A TSHD
S3SHMMXU21MXTotSHD$phsB$cValmagf	Summation 3 phase B TSHD
S3SHMMXU21MXTotSHD$phsC$cValmagf	Summation 3 phase C TSHD
S3SHMMXU21MXSHDA1$phsA$cValmagf	Summation 3 phase A Subharmonic Magnitude 1st
S3SHMMXU21MXSHDA1$phsA$cHzmagf	Summation 3 phase A Subharmonic Frequency 1st
S3SHMMXU21MXSHDA1$phsB$cValmagf	Summation 3 phase B Subharmonic Magnitude 1st
S3SHMMXU21MXSHDA1$phsB$cHzmagf	Summation 3 phase B Subharmonic Frequency 1st
S3SHMMXU21MXSHDA1$phsC$cValmagf	Summation 3 phase C Subharmonic Magnitude 1st
S3SHMMXU21MXSHDA1$phsC$cHzmagf	Summation 3 phase C Subharmonic Frequency 1st
S3SHMMXU21MXSHDA2$phsA$cValmagf	Summation 3 phase A Subharmonic Magnitude 2nd
S3SHMMXU21MXSHDA2$phsA$cHzmagf	Summation 3 phase A Subharmonic Frequency 2nd
S3SHMMXU21MXSHDA2$phsB$cValmagf	Summation 3 phase B Subharmonic Magnitude 2nd
S3SHMMXU21MXSHDA2$phsB$cHzmagf	Summation 3 phase B Subharmonic Frequency 2nd
S3SHMMXU21MXSHDA2$phsC$cValmagf	Summation 3 phase C Subharmonic Magnitude 2nd

S3SHMMXU21MXSHDA2$phsC$cHzmagf	Summation 3 phase C Subharmonic Frequency 2nd
S3SHMMXU21MXSHDA3$phsA$cValmagf	Summation 3 phase A Subharmonic Magnitude 3rd
S3SHMMXU21MXSHDA3$phsA$cHzmagf	Summation 3 phase A Subharmonic Frequency 3rd
S3SHMMXU21MXSHDA3$phsB$cValmagf	Summation 3 phase B Subharmonic Magnitude 3rd
S3SHMMXU21MXSHDA3$phsB$cHzmagf	Summation 3 phase B Subharmonic Frequency 3rd
S3SHMMXU21MXSHDA3$phsC$cValmagf	Summation 3 phase C Subharmonic Magnitude 3rd
S3SHMMXU21MXSHDA3$phsC$cHzmagf	Summation 3 phase C Subharmonic Frequency 3rd
S3SHMMXU21MXSHDA4$phsA$cValmagf	Summation 3 phase A Subharmonic Magnitude 4th
S3SHMMXU21MXSHDA4$phsA$cHzmagf	Summation 3 phase A Subharmonic Frequency 4th
S3SHMMXU21MXSHDA4$phsB$cValmagf	Summation 3 phase B Subharmonic Magnitude 4th
S3SHMMXU21MXSHDA4$phsB$cHzmagf	Summation 3 phase B Subharmonic Frequency 4th
S3SHMMXU21MXSHDA4$phsC$cValmagf	Summation 3 phase C Subharmonic Magnitude 4th
S3SHMMXU21MXSHDA4$phsC$cHzmagf	Summation 3 phase C Subharmonic Frequency 4th
S3SHMMXU21MXSHDA5$phsA$cValmagf	Summation 3 phase A Subharmonic Magnitude 5th
S3SHMMXU21MXSHDA5$phsA$cHzmagf	Summation 3 phase A Subharmonic Frequency 5th
S3SHMMXU21MXSHDA5$phsB$cValmagf	Summation 3 phase B Subharmonic Magnitude 5th
S3SHMMXU21MXSHDA5$phsB$cHzmagf	Summation 3 phase B Subharmonic Frequency 5th
S3SHMMXU21MXSHDA5$phsC$cValmagf	Summation 3 phase C Subharmonic Magnitude 5th
S3SHMMXU21MXSHDA5$phsC$cHzmagf	Summation 3 phase C Subharmonic Frequency 5th

S4SHMMXU22

This section defines data for the logical node S4SHMMXU22.

Data Name	Name
S4SHMMXU22MXTotSHD$phsA$cValmagf	Summation 4 phase A TSHD
S4SHMMXU22MXTotSHD$phsB$cValmagf	Summation 4 phase B TSHD
S4SHMMXU22MXTotSHD$phsC$cValmagf	Summation 4 phase C TSHD
S4SHMMXU22MXSHDA1$phsA$cValmagf	Summation 4 phase A Subharmonic Magnitude 1st
S4SHMMXU22MXSHDA1$phsA$cHzmagf	Summation 4 phase A Subharmonic Frequency 1st
S4SHMMXU22MXSHDA1$phsB$cValmagf	Summation 4 phase B Subharmonic Magnitude 1st
S4SHMMXU22MXSHDA1$phsB$cHzmagf	Summation 4 phase B Subharmonic Frequency 1st

S4SHMMXU22MXSHDA1$phsC$cValmagf	Summation 4 phase C Subharmonic Magnitude 1st
S4SHMMXU22MXSHDA1$phsC$cHzmagf	Summation 4 phase C Subharmonic Frequency 1st
S4SHMMXU22MXSHDA2$phsA$cValmagf	Summation 4 phase A Subharmonic Magnitude 2nd
S4SHMMXU22MXSHDA2$phsA$cHzmagf	Summation 4 phase A Subharmonic Frequency 2nd
S4SHMMXU22MXSHDA2$phsB$cValmagf	Summation 4 phase B Subharmonic Magnitude 2nd
S4SHMMXU22MXSHDA2$phsB$cHzmagf	Summation 4 phase B Subharmonic Frequency 2nd
S4SHMMXU22MXSHDA2$phsC$cValmagf	Summation 4 phase C Subharmonic Magnitude 2nd
S4SHMMXU22MXSHDA2$phsC$cHzmagf	Summation 4 phase C Subharmonic Frequency 2nd
S4SHMMXU22MXSHDA3$phsA$cValmagf	Summation 4 phase A Subharmonic Magnitude 3rd
S4SHMMXU22MXSHDA3$phsA$cHzmagf	Summation 4 phase A Subharmonic Frequency 3rd
S4SHMMXU22MXSHDA3$phsB$cValmagf	Summation 4 phase B Subharmonic Magnitude 3rd
S4SHMMXU22MXSHDA3$phsB$cHzmagf	Summation 4 phase B Subharmonic Frequency 3rd
S4SHMMXU22MXSHDA3$phsC$cValmagf	Summation 4 phase C Subharmonic Magnitude 3rd
S4SHMMXU22MXSHDA3$phsC$cHzmagf	Summation 4 phase C Subharmonic Frequency 3rd
S4SHMMXU22MXSHDA4$phsA$cValmagf	Summation 4 phase A Subharmonic Magnitude 4th
S4SHMMXU22MXSHDA4$phsA$cHzmagf	Summation 4 phase A Subharmonic Frequency 4th
S4SHMMXU22MXSHDA4$phsB$cValmagf	Summation 4 phase B Subharmonic Magnitude 4th
S4SHMMXU22MXSHDA4$phsB$cHzmagf	Summation 4 phase B Subharmonic Frequency 4th
S4SHMMXU22MXSHDA4$phsC$cValmagf	Summation 4 phase C Subharmonic Magnitude 4th
S4SHMMXU22MXSHDA4$phsC$cHzmagf	Summation 4 phase C Subharmonic Frequency 4th
S4SHMMXU22MXSHDA5$phsA$cValmagf	Summation 4 phase A Subharmonic Magnitude 5th
S4SHMMXU22MXSHDA5$phsA$cHzmagf	Summation 4 phase A Subharmonic Frequency 5th
S4SHMMXU22MXSHDA5$phsB$cValmagf	Summation 4 phase B Subharmonic Magnitude 5th
S4SHMMXU22MXSHDA5$phsB$cHzmagf	Summation 4 phase B Subharmonic Frequency 5th
S4SHMMXU22MXSHDA5$phsC$cValmagf	Summation 4 phase C Subharmonic Magnitude 5th
S4SHMMXU22MXSHDA5$phsC$cHzmagf	Summation 4 phase C Subharmonic Frequency 5th

FaultData Logical Device

D59M1MMXU1

This section defines data for the logical node D59M1MMXU1.

Data Name	Name
D59M1MMXU1MXPhV$phsA$cValmagf	59-1 Main phase A voltage Magnitude
D59M1MMXU1MXPhV$phsA$cValangf	59-1 Main phase A voltage Angle
D59M1MMXU1MXPhV$phsB$cValmagf	59-1 Main phase B voltage Magnitude
D59M1MMXU1MXPhV$phsB$cValangf	59-1 Main phase B voltage Angle
D59M1MMXU1MXPhV$phsC$cValmagf	59-1 Main phase C voltage Magnitude
D59M1MMXU1MXPhV$phsC$cValangf	59-1 Main phase C voltage Angle

D59M2MMXU2

This section defines data for the logical node D59M2MMXU2.

Data Name	Name
D59M2MMXU2MXPhV$phsA$cValmagf	59-2 Main phase A voltage Magnitude
D59M2MMXU2MXPhV$phsA$cValangf	59-2 Main phase A voltage Angle
D59M2MMXU2MXPhV$phsB$cValmagf	59-2 Main phase B voltage Magnitude
D59M2MMXU2MXPhV$phsB$cValangf	59-2 Main phase B voltage Angle
D59M2MMXU2MXPhV$phsC$cValmagf	59-2 Main phase C voltage Magnitude
D59M2MMXU2MXPhV$phsC$cValangf	59-2 Main phase C voltage Angle

D59A1MMXU3

This section defines data for the logical node D59A1MMXU3.

Data Name	Name
D59A1MMXU3MXPhV$phsA$cValmagf	59-1 Auxiliary phase A voltage Magnitude
D59A1MMXU3MXPhV$phsA$cValangf	59-1 Auxiliary phase A voltage Angle
D59A1MMXU3MXPhV$phsB$cValmagf	59-1 Auxiliary phase B voltage Magnitude
D59A1MMXU3MXPhV$phsB$cValangf	59-1 Auxiliary phase B voltage Angle
D59A1MMXU3MXPhV$phsC$cValmagf	59-1 Auxiliary phase C voltage Magnitude
D59A1MMXU3MXPhV$phsC$cValangf	59-1 Auxiliary phase C voltage Angle

D59A2MMXU4

This section defines data for the logical node D59A2MMXU4.

Data Name	Name
D59A2MMXU4MXPhV$phsA$cValmagf	59-2 Auxiliary phase A voltage Magnitude
D59A2MMXU4MXPhV$phsA$cValangf	59-2 Auxiliary phase A voltage Angle
D59A2MMXU4MXPhV$phsB$cValmagf	59-2 Auxiliary phase B voltage Magnitude
D59A2MMXU4MXPhV$phsB$cValangf	59-2 Auxiliary phase B voltage Angle
D59A2MMXU4MXPhV$phsC$cValmagf	59-2 Auxiliary phase C voltage Magnitude
D59A2MMXU4MXPhV$phsC$cValangf	59-2 Auxiliary phase C voltage Angle

D27MMMXU5

This section defines data for the logical node D27MMMXU5.

Data Name	Name
D27MMMXU5MXPhV$phsA$cValmagf	27 Main phase A voltage Magnitude
D27MMMXU5MXPhV$phsA$cValangf	27 Main phase A voltage Angle
D27MMMXU5MXPhV$phsB$cValmagf	27 Main phase B voltage Magnitude
D27MMMXU5MXPhV$phsB$cValangf	27 Main phase B voltage Angle
D27MMMXU5MXPhV$phsC$cValmagf	27 Main phase C voltage Magnitude
D27MMMXU5MXPhV$phsC$cValangf	27 Main phase C voltage Angle

D27AMMXU6

This section defines data for the logical node D27AMMXU6.

Data Name	Name
D27AMMXU6MXPhV$phsA$cValmagf	27 Auxiliary phase A voltage Magnitude
D27AMMXU6MXPhV$phsA$cValangf	27 Auxiliary phase A voltage Angle
D27AMMXU6MXPhV$phsB$cValmagf	27 Auxiliary phase B voltage Magnitude
D27AMMXU6MXPhV$phsB$cValangf	27 Auxiliary phase B voltage Angle
D27AMMXU6MXPhV$phsC$cValmagf	27 Auxiliary phase C voltage Magnitude
D27AMMXU6MXPhV$phsC$cValangf	27 Auxiliary phase C voltage Angle

D50I1MMXU7

This section defines data for the logical node D50I1MMXU7.

Data Name	Name
D50I1MMXU7MXA$phsA$cValmagf	50LS Current 1 phase A Magnitude
D50I1MMXU7MXA$phsA$cValangf	50LS Current 1 phase A Angle
D50I1MMXU7MXA$phsB$cValmagf	50LS Current 1 phase B Magnitude

D50I1MMXU7MXA$phsB$cValangf	50LS Current 1 phase B Angle
D50I1MMXU7MXA$phsC$cValmagf	50LS Current 1 phase C Magnitude
D50I1MMXU7MXA$phsC$cValangf	50LS Current 1 phase C Angle

D50I2MMXU8

This section defines data for the logical node D50I2MMXU8.

Data Name	Name
D50I2MMXU8MXA$phsA$cValmagf	50LS Current 2 phase A Magnitude
D50I2MMXU8MXA$phsA$cValangf	50LS Current 2 phase A Angle
D50I2MMXU8MXA$phsB$cValmagf	50LS Current 2 phase B Magnitude
D50I2MMXU8MXA$phsB$cValangf	50LS Current 2 phase B Angle
D50I2MMXU8MXA$phsC$cValmagf	50LS Current 2 phase C Magnitude
D50I2MMXU8MXA$phsC$cValangf	50LS Current 2 phase C Angle

D50I3MMXU9

This section defines data for the logical node D50I3MMXU9.

Data Name	Name
D50I3MMXU9MXA$phsA$cValmagf	50LS Current 3 phase A Magnitude
D50I3MMXU9MXA$phsA$cValangf	50LS Current 3 phase A Angle
D50I3MMXU9MXA$phsB$cValmagf	50LS Current 3 phase b Magnitude
D50I3MMXU9MXA$phsB$cValangf	50LS Current 3 phase B Angle
D50I3MMXU9MXA$phsC$cValmagf	50LS Current 3 phase C Magnitude
D50I3MMXU9MXA$phsC$cValangf	50LS Current 3 phase C Angle

D50I4MMXU10

This section defines data for the logical node D50I4MMXU10.

Data Name	Name
D50I4MMXU10MXA$phsA$cValmagf	50LS Current 4 phase A Magnitude
D50I4MMXU10MXA$phsA$cValangf	50LS Current 4 phase A Angle
D50I4MMXU10MXA$phsB$cValmagf	50LS Current 4 phase B Magnitude
D50I4MMXU10MXA$phsB$cValangf	50LS Current 4 phase B Angle
D50I4MMXU10MXA$phsC$cValmagf	50LS Current 4 phase C Magnitude
D50I4MMXU10MXA$phsC$cValangf	50LS Current 4 phase C Angle

D50S1MMXU11

This section defines data for the logical node D50S1MMXU11.

Data attribute Name	Name
D50S1MMXU11MXA$phsA$cValmagf	50LS Summation 1 phase A Magnitude
D50S1MMXU11MXA$phsA$cValangf	50LS Summation 1 phase A Angle
D50S1MMXU11MXA$phsB$cValmagf	50LS Summation 1 phase B Magnitude
D50S1MMXU11MXA$phsB$cValangf	50LS Summation 1 phase B Angle
D50S1MMXU11MXA$phsC$cValmagf	50LS Summation 1 phase C Magnitude
D50S1MMXU11MXA$phsC$cValangf	50LS Summation 1 phase C Angle

D50S2MMXU12

This section defines data for the logical node D50S2MMXU12.

Data Name	Name
D50S2MMXU12MXA$phsA$cValmagf	50LS Summation 2 phase A Magnitude
D50S2MMXU12MXA$phsA$cValangf	50LS Summation 2 phase A Angle
D50S2MMXU12MXA$phsB$cValmagf	50LS Summation 2 phase B Magnitude
D50S2MMXU12MXA$phsB$cValangf	50LS Summation 2 phase B Angle
D50S2MMXU12MXA$phsC$cValmagf	50LS Summation 2 phase C Magnitude
D50S2MMXU12MXA$phsC$cValangf	50LS Summation 2 phase C Angle

D50S3MMXU13

This section defines data for the logical node D50S3MMXU13.

Data Name	Name
D50S3MMXU13MXA$phsA$cValmagf	50LS Summation 3 phase A Magnitude
D50S3MMXU13MXA$phsA$cValangf	50LS Summation 3 phase A Angle
D50S3MMXU13MXA$phsB$cValmagf	50LS Summation 3 phase B Magnitude
D50S3MMXU13MXA$phsB$cValangf	50LS Summation 3 phase B Angle
D50S3MMXU13MXA$phsC$cValmagf	50LS Summation 3 phase C Magnitude
D50S3MMXU13MXA$phsC$cValangf	50LS Summation 3 phase C Angle

D50S4MMXU14

This section defines data for the logical node D50S4MMXU14.

Data Name	Name
D50S4MMXU14MXA$phsA$cValmagf	50LS Summation 4 phase A Magnitude
D50S4MMXU14MXA$phsA$cValangf	50LS Summation 4 phase A Angle
D50S4MMXU14MXA$phsB$cValmagf	50LS Summation 4 phase B Magnitude
D50S4MMXU14MXA$phsB$cValangf	50LS Summation 4 phase B Angle
D50S4MMXU14MXA$phsC$cValmagf	50LS Summation 4 phase C Magnitude
D50S4MMXU14MXA$phsC$cValangf	50LS Summation 4 phase C Angle

MSD1MMXU15

This section defines data for the logical node MSD1MMXU15.

Data Name	Name
MSD1MMXU15MXSHDPhV1$phsA$type	Main Voltage Detector 1 phase A Type
MSD1MMXU15MXSHDPhV1$phsB$type	Main Voltage Detector 1 phase B Type
MSD1MMXU15MXSHDPhV1$phsC$type	Main Voltage Detector 1 phase C Type
MSD1MMXU15MXPhV$phsA$cValmagf	Main Voltage Detector 1 phase A Magnitude
MSD1MMXU15MXPhV$phsB$cValmagf	Main Voltage Detector 1 phase B Magnitude
MSD1MMXU15MXPhV$phsC$cValmagf	Main Voltage Detector 1 phase C Magnitude
MSD1MMXU15MXSHDPhV1$phsA$cHzmagf	Main Voltage Detector 1 phase A subharmonic Frequency
MSD1MMXU15MXSHDPhV1$phsB$cHzmagf	Main Voltage Detector 1 phase B subharmonic Frequency
MSD1MMXU15MXSHDPhV1$phsC$cHzmagf	Main Voltage Detector 1 phase C subharmonic Frequency
MSD1MMXU15MXSHDPhV1$phsA$cValmagf	Main Voltage Detector 1 phase A subharmonic Magnitude
MSD1MMXU15MXSHDPhV1$phsB$cValmagf	Main Voltage Detector 1 phase B subharmonic Magnitude
MSD1MMXU15MXSHDPhV1$phsC$cValmagf	Main Voltage Detector 1 phase C subharmonic Magnitude
MSD1MMXU15MXTotSHD$phsA$cValmagf	Main Voltage Detector 1 phase A subharmonic distortions (%)
MSD1MMXU15MXTotSHD$phsB$cValmagf	Main Voltage Detector 1 phase B subharmonic distortions (%)
MSD1MMXU15MXTotSHD$phsC$cValmagf	Main Voltage Detector 1 phase C subharmonic distortions (%)

MSD2MMXU16

This section defines data for the logical node MSD2MMXU16.

Data Name	Name
MSD2MMXU16MXSHDPhV1$phsA$type	Main Voltage Detector 2 phase A Type
MSD2MMXU16MXSHDPhV1$phsB$type	Main Voltage Detector 2 phase B Type
MSD2MMXU16MXSHDPhV1$phsC$type	Main Voltage Detector 2 phase C Type
MSD2MMXU16MXPhV$phsA$cValmagf	Main Voltage Detector 2 phase A Magnitude
MSD2MMXU16MXPhV$phsB$cValmagf	Main Voltage Detector 2 phase B Magnitude
MSD2MMXU16MXPhV$phsC$cValmagf	Main Voltage Detector 2 phase C Magnitude
MSD2MMXU16MXSHDPhV1$phsA$cHzmagf	Main Voltage Detector 2 phase A subharmonic Frequency
MSD2MMXU16MXSHDPhV1$phsB$cHzmagf	Main Voltage Detector 2 phase B subharmonic Frequency
MSD2MMXU16MXSHDPhV1$phsC$cHzmagf	Main Voltage Detector 2 phase C subharmonic Frequency
MSD2MMXU16MXSHDPhV1$phsA$cValmagf	Main Voltage Detector 2 phase A subharmonic Magnitude
MSD2MMXU16MXSHDPhV1$phsB$cValmagf	Main Voltage Detector 2 phase B subharmonic Magnitude
MSD2MMXU16MXSHDPhV1$phsC$cValmagf	Main Voltage Detector 2 phase C subharmonic Magnitude
MSD2MMXU16MXTotSHD$phsA$cValmagf	Main Voltage Detector 2 phase A subharmonic distortions (%)
MSD2MMXU16MXTotSHD$phsB$cValmagf	Main Voltage Detector 2 phase B subharmonic distortions (%)
MSD2MMXU16MXTotSHD$phsC$cValmagf	Main Voltage Detector 2 phase C subharmonic distortions (%)

ASD1MMXU17

This section defines data for the logical node ASD1MMXU17.

Data Name	Name
ASD1MMXU17MXSHDPhV1$phsA$type	Auxiliary Voltage Detector 1 phase A Type
ASD1MMXU17MXSHDPhV1$phsB$type	Auxiliary Voltage Detector 1 phase B Type
ASD1MMXU17MXSHDPhV1$phsC$type	Auxiliary Voltage Detector 1 phase C Type
ASD1MMXU17MXPhV$phsA$cValmagf	Auxiliary Voltage Detector 1 phase A Magnitude
ASD1MMXU17MXPhV$phsB$cValmagf	Auxiliary Voltage Detector 1 phase B Magnitude
ASD1MMXU17MXPhV$phsC$cValmagf	Auxiliary Voltage Detector 1 phase C Magnitude
ASD1MMXU17MXSHDPhV1$phsA$cHzmagf	Auxiliary Voltage Detector 1 phase A subharmonic Frequency
ASD1MMXU17MXSHDPhV1$phsB$cHzmagf	Auxiliary Voltage Detector 1 phase B subharmonic Frequency
ASD1MMXU17MXSHDPhV1$phsC$cHzmagf	Auxiliary Voltage Detector 1 phase C subharmonic Frequency
ASD1MMXU17MXSHDPhV1$phsA$cValmagf	Auxiliary Voltage Detector 1 phase A subharmonic Magnitude
ASD1MMXU17MXSHDPhV1$phsB$cValmagf	Auxiliary Voltage Detector 1 phase B subharmonic Magnitude
ASD1MMXU17MXSHDPhV1$phsC$cValmagf	Auxiliary Voltage Detector 1 phase C subharmonic Magnitude
ASD1MMXU17MXTotSHD$phsA$cValmagf	Auxiliary Voltage Detector 1 phase A subharmonic distortions (%)
ASD1MMXU17MXTotSHD$phsB$cValmagf	Auxiliary Voltage Detector 1 phase B subharmonic distortions (%)
ASD1MMXU17MXTotSHD$phsC$cValmagf	Auxiliary Voltage Detector 1 phase C subharmonic distortions (%)

ASD2MMXU18

This section defines data for the logical node ASD2MMXU18.

Data Name	Name
ASD2MMXU18MXSHDPhV1$phsA$type	Auxiliary Voltage Detector 2 phase A Type
ASD2MMXU18MXSHDPhV1$phsB$type	Auxiliary Voltage Detector 2 phase B Type
ASD2MMXU18MXSHDPhV1$phsC$type	Auxiliary Voltage Detector 2 phase C Type
ASD2MMXU18MXPhV$phsA$cValmagf	Auxiliary Voltage Detector 2 phase A Magnitude
ASD2MMXU18MXPhV$phsB$cValmagf	Auxiliary Voltage Detector 2 phase B Magnitude
ASD2MMXU18MXPhV$phsC$cValmagf	Auxiliary Voltage Detector 2 phase C Magnitude
ASD2MMXU18MXSHDPhV1$phsA$cHzmagf	Auxiliary Voltage Detector 2 phase A subharmonic Frequency
ASD2MMXU18MXSHDPhV1$phsB$cHzmagf	Auxiliary Voltage Detector 2 phase B subharmonic Frequency
ASD2MMXU18MXSHDPhV1$phsC$cHzmagf	Auxiliary Voltage Detector 2 phase C subharmonic Frequency
ASD2MMXU18MXSHDPhV1$phsA$cValmagf	Auxiliary Voltage Detector 2 phase A subharmonic Magnitude
ASD2MMXU18MXSHDPhV1$phsB$cValmagf	Auxiliary Voltage Detector 2 phase B subharmonic Magnitude
ASD2MMXU18MXSHDPhV1$phsC$cValmagf	Auxiliary Voltage Detector 2 phase C subharmonic Magnitude
ASD2MMXU18MXTotSHD$phsA$cValmagf	Auxiliary Voltage Detector 2 phase A subharmonic distortions (%)
ASD2MMXU18MXTotSHD$phsB$cValmagf	Auxiliary Voltage Detector 2 phase B subharmonic distortions (%)
ASD2MMXU18MXTotSHD$phsC$cValmagf	Auxiliary Voltage Detector 2 phase C subharmonic distortions (%)

I1SD1MMXU19

This section defines data for the logical node I1SD1MMXU19.

Data Name	Name
I1SD1MMXU19MXSHDA1$phsA$type	Current 1 Detector 1 phase A Type
I1SD1MMXU19MXSHDA1$phsB$type	Current 1 Detector 1 phase B Type
I1SD1MMXU19MXSHDA1$phsC$type	Current 1 Detector 1 phase C Type
I1SD1MMXU19MXA$phsA$cValmagf	Current 1 Detector 1 phase A Magnitude
I1SD1MMXU19MXA$phsB$cValmagf	Current 1 Detector 1 phase B Magnitude
I1SD1MMXU19MXA$phsC$cValmagf	Current 1 Detector 1 phase C Magnitude
I1SD1MMXU19MXSHDA1$phsA$cHzmagf	Current 1 Detector 1 phase A subharmonic Frequency
I1SD1MMXU19MXSHDA1$phsB$cHzmagf	Current 1 Detector 1 phase B subharmonic Frequency
I1SD1MMXU19MXSHDA1$phsC$cHzmagf	Current 1 Detector 1 phase C subharmonic Frequency
I1SD1MMXU19MXSHDA1$phsA$cValmagf	Current 1 Detector 1 phase A subharmonic Magnitude
I1SD1MMXU19MXSHDA1$phsB$cValmagf	Current 1 Detector 1 phase B subharmonic Magnitude
I1SD1MMXU19MXSHDA1$phsC$cValmagf	Current 1 Detector 1 phase C subharmonic Magnitude
I1SD1MMXU19MXTotSHD$phsA$cValmagf	Current 1 Detector 1 phase A subharmonic distortions (%)
I1SD1MMXU19MXTotSHD$phsB$cValmagf	Current 1 Detector 1 phase B subharmonic distortions (%)
I1SD1MMXU19MXTotSHD$phsC$cValmagf	Current 1 Detector 1 phase C subharmonic distortions (%)

I1SD2MMXU20

This section defines data for the logical node I1SD2MMXU20.

Data Name	Name
I1SD2MMXU20MXSHDA1$phsA$type	Current 1 Detector 2 phase A Type
I1SD2MMXU20MXSHDA1$phsB$type	Current 1 Detector 2 phase B Type
I1SD2MMXU20MXSHDA1$phsC$type	Current 1 Detector 2 phase C Type
I1SD2MMXU20MXA$phsA$cValmagf	Current 1 Detector 2 phase A Magnitude
I1SD2MMXU20MXA$phsB$cValmagf	Current 1 Detector 2 phase B Magnitude
I1SD2MMXU20MXA$phsC$cValmagf	Current 1 Detector 2 phase C Magnitude
I1SD2MMXU20MXSHDA1$phsA$cHzmagf	Current 1 Detector 2 phase A subharmonic Frequency
I1SD2MMXU20MXSHDA1$phsB$cHzmagf	Current 1 Detector 2 phase B subharmonic Frequency
I1SD2MMXU20MXSHDA1$phsC$cHzmagf	Current 1 Detector 2 phase C subharmonic Frequency
I1SD2MMXU20MXSHDA1$phsA$cValmagf	Current 1 Detector 2 phase A subharmonic Magnitude
I1SD2MMXU20MXSHDA1$phsB$cValmagf	Current 1 Detector 2 phase B subharmonic Magnitude
I1SD2MMXU20MXSHDA1$phsC$cValmagf	Current 1 Detector 2 phase C subharmonic Magnitude
I1SD2MMXU20MXTotSHD$phsA$cValmagf	Current 1 Detector 2 phase A subharmonic distortions (%)
I1SD2MMXU20MXTotSHD$phsB$cValmagf	Current 1 Detector 2 phase B subharmonic distortions (%)
I1SD2MMXU20MXTotSHD$phsC$cValmagf	Current 1 Detector 2 phase C subharmonic distortions (%)

I2SD1MMXU21

This section defines data for the logical node I2SD1MMXU21.

Data Name	Name
I2SD1MMXU21MXSHDA1$phsA$type	Current 2 Detector 1 phase A Type
I2SD1MMXU21MXSHDA1$phsB$type	Current 2 Detector 1 phase B Type
I2SD1MMXU21MXSHDA1$phsC$type	Current 2 Detector 1 phase C Type
I2SD1MMXU21MXA$phsA$cValmagf	Current 2 Detector 1 phase A Magnitude
I2SD1MMXU21MXA$phsB$cValmagf	Current 2 Detector 1 phase B Magnitude
I2SD1MMXU21MXA$phsC$cValmagf	Current 2 Detector 1 phase C Magnitude
I2SD1MMXU21MXSHDA1$phsA$cHzmagf	Current 2 Detector 1 phase A subharmonic Frequency
I2SD1MMXU21MXSHDA1$phsB$cHzmagf	Current 2 Detector 1 phase B subharmonic Frequency
I2SD1MMXU21MXSHDA1$phsC$cHzmagf	Current 2 Detector 1 phase C subharmonic Frequency
I2SD1MMXU21MXSHDA1$phsA$cValmagf	Current 2 Detector 1 phase A subharmonic Magnitude
I2SD1MMXU21MXSHDA1$phsB$cValmagf	Current 2 Detector 1 phase B subharmonic Magnitude
I2SD1MMXU21MXSHDA1$phsC$cValmagf	Current 2 Detector 1 phase C subharmonic Magnitude
I2SD1MMXU21MXTotSHD$phsA$cValmagf	Current 2 Detector 1 phase A subharmonic distortions (%)
I2SD1MMXU21MXTotSHD$phsB$cValmagf	Current 2 Detector 1 phase B subharmonic distortions (%)
I2SD1MMXU21MXTotSHD$phsC$cValmagf	Current 2 Detector 1 phase C subharmonic distortions (%)

I2SD2MMXU22

This section defines data for the logical node I2SD2MMXU22.

Data Name	Name
I2SD2MMXU22MXSHDA1$phsA$type	Current 2 Detector 2 phase A Type
I2SD2MMXU22MXSHDA1$phsB$type	Current 2 Detector 2 phase B Type
I2SD2MMXU22MXSHDA1$phsC$type	Current 2 Detector 2 phase C Type
I2SD2MMXU22MXA$phsA$cValmagf	Current 2 Detector 2 phase A Magnitude
I2SD2MMXU22MXA$phsB$cValmagf	Current 2 Detector 2 phase B Magnitude
I2SD2MMXU22MXA$phsC$cValmagf	Current 2 Detector 2 phase C Magnitude
I2SD2MMXU22MXSHDA1$phsA$cHzmagf	Current 2 Detector 2 phase A subharmonic Frequency
I2SD2MMXU22MXSHDA1$phsB$cHzmagf	Current 2 Detector 2 phase B subharmonic Frequency
I2SD2MMXU22MXSHDA1$phsC$cHzmagf	Current 2 Detector 2 phase C subharmonic Frequency
I2SD2MMXU22MXSHDA1$phsA$cValmagf	Current 2 Detector 2 phase A subharmonic Magnitude
I2SD2MMXU22MXSHDA1$phsB$cValmagf	Current 2 Detector 2 phase B subharmonic Magnitude
I2SD2MMXU22MXSHDA1$phsC$cValmagf	Current 2 Detector 2 phase C subharmonic Magnitude
I2SD2MMXU22MXTotSHD$phsA$cValmagf	Current 2 Detector 2 phase A subharmonic distortions (%)
I2SD2MMXU22MXTotSHD$phsB$cValmagf	Current 2 Detector 2 phase B subharmonic distortions (%)
I2SD2MMXU22MXTotSHD$phsC$cValmagf	Current 2 Detector 2 phase C subharmonic distortions (%)

I3SD1MMXU23

This section defines data for the logical node I3SD1MMXU23.

Data Name	Name
I3SD1MMXU23MXSHDA1$phsA$type	Current 3 Detector 1 phase A Type
I3SD1MMXU23MXSHDA1$phsB$type	Current 3 Detector 1 phase B Type
I3SD1MMXU23MXSHDA1$phsC$type	Current 3 Detector 1 phase C Type
I3SD1MMXU23MXA$phsA$cValmagf	Current 3 Detector 1 phase A Magnitude
I3SD1MMXU23MXA$phsB$cValmagf	Current 3 Detector 1 phase B Magnitude
I3SD1MMXU23MXA$phsC$cValmagf	Current 3 Detector 1 phase C Magnitude
I3SD1MMXU23MXSHDA1$phsA$cHzmagf	Current 3 Detector 1 phase A subharmonic Frequency
I3SD1MMXU23MXSHDA1$phsB$cHzmagf	Current 3 Detector 1 phase B subharmonic Frequency
I3SD1MMXU23MXSHDA1$phsC$cHzmagf	Current 3 Detector 1 phase C subharmonic Frequency
I3SD1MMXU23MXSHDA1$phsA$cValmagf	Current 3 Detector 1 phase A subharmonic Magnitude
I3SD1MMXU23MXSHDA1$phsB$cValmagf	Current 3 Detector 1 phase B subharmonic Magnitude
I3SD1MMXU23MXSHDA1$phsC$cValmagf	Current 3 Detector 1 phase C subharmonic Magnitude
I3SD1MMXU23MXTotSHD$phsA$cValmagf	Current 3 Detector 1 phase A subharmonic distortions (%)
I3SD1MMXU23MXTotSHD$phsB$cValmagf	Current 3 Detector 1 phase B subharmonic distortions (%)
I3SD1MMXU23MXTotSHD$phsC$cValmagf	Current 3 Detector 1 phase C subharmonic distortions (%)

I3SD2MMXU24

This section defines data for the logical node I3SD2MMXU24.

Data Name	Name
I3SD2MMXU24MXSHDA1$phsA$type	Current 3 Detector 2 phase A Type
I3SD2MMXU24MXSHDA1$phsB$type	Current 3 Detector 2 phase B Type
I3SD2MMXU24MXSHDA1$phsC$type	Current 3 Detector 2 phase C Type
I3SD2MMXU24MXA$phsA$cValmagf	Current 3 Detector 2 phase A Magnitude
I3SD2MMXU24MXA$phsB$cValmagf	Current 3 Detector 2 phase B Magnitude
I3SD2MMXU24MXA$phsC$cValmagf	Current 3 Detector 2 phase C Magnitude
I3SD2MMXU24MXSHDA1$phsA$cHzmagf	Current 3 Detector 2 phase A subharmonic Frequency
I3SD2MMXU24MXSHDA1$phsB$cHzmagf	Current 3 Detector 2 phase B subharmonic Frequency
I3SD2MMXU24MXSHDA1$phsC$cHzmagf	Current 3 Detector 2 phase C subharmonic Frequency
I3SD2MMXU24MXSHDA1$phsA$cValmagf	Current 3 Detector 2 phase A subharmonic Magnitude
I3SD2MMXU24MXSHDA1$phsB$cValmagf	Current 3 Detector 2 phase B subharmonic Magnitude
I3SD2MMXU24MXSHDA1$phsC$cValmagf	Current 3 Detector 2 phase C subharmonic Magnitude
I3SD2MMXU24MXTotSHD$phsA$cValmagf	Current 3 Detector 2 phase A subharmonic distortions (%)
I3SD2MMXU24MXTotSHD$phsB$cValmagf	Current 3 Detector 2 phase B subharmonic distortions (%)
I3SD2MMXU24MXTotSHD$phsC$cValmagf	Current 3 Detector 2 phase C subharmonic distortions(%)

I4SD1MMXU25

This section defines data for the logical node I4SD1MMXU25.

Data Name	Name
I4SD1MMXU25MXSHDA1$phsA$type	Current 4 Detector 1 phase A Type
I4SD1MMXU25MXSHDA1$phsB$type	Current 4 Detector 1 phase B Type
I4SD1MMXU25MXSHDA1$phsC$type	Current 4 Detector 1 phase C Type
I4SD1MMXU25MXA$phsA$cValmagf	Current 4 Detector 1 phase A Magnitude
I4SD1MMXU25MXA$phsB$cValmagf	Current 4 Detector 1 phase B Magnitude
I4SD1MMXU25MXA$phsC$cValmagf	Current 4 Detector 1 phase C Magnitude
I4SD1MMXU25MXSHDA1$phsA$cHzmagf	Current 4 Detector 1 phase A subharmonic Frequency
I4SD1MMXU25MXSHDA1$phsB$cHzmagf	Current 4 Detector 1 phase B subharmonic Frequency
I4SD1MMXU25MXSHDA1$phsC$cHzmagf	Current 4 Detector 1 phase C subharmonic Frequency
I4SD1MMXU25MXSHDA1$phsA$cValmagf	Current 4 Detector 1 phase A subharmonic Magnitude
I4SD1MMXU25MXSHDA1$phsB$cValmagf	Current 4 Detector 1 phase B subharmonic Magnitude
I4SD1MMXU25MXSHDA1$phsC$cValmagf	Current 4 Detector 1 phase C subharmonic Magnitude
I4SD1MMXU25MXTotSHD$phsA$cValmagf	Current 4 Detector 1 phase A subharmonic distortions (%)
I4SD1MMXU25MXTotSHD$phsB$cValmagf	Current 4 Detector 1 phase B subharmonic distortions (%)
I4SD1MMXU25MXTotSHD$phsC$cValmagf	Current 4 Detector 1 phase C subharmonic distortions (%)

I4SD2MMXU26

This section defines data for the logical node I4SD2MMXU26.

Data Name	Name
I4SD2MMXU26MXSHDA1$phsA$type	Current 4 Detector 2 phase A Type
I4SD2MMXU26MXSHDA1$phsB$type	Current 4 Detector 2 phase B Type
I4SD2MMXU26MXSHDA1$phsC$type	Current 4 Detector 2 phase C Type
I4SD2MMXU26MXA$phsA$cValmagf	Current 4 Detector 2 phase A Magnitude
I4SD2MMXU26MXA$phsB$cValmagf	Current 4 Detector 2 phase B Magnitude
I4SD2MMXU26MXA$phsC$cValmagf	Current 4 Detector 2 phase C Magnitude
I4SD2MMXU26MXSHDA1$phsA$cHzmagf	Current 4 Detector 2 phase A subharmonic Frequency
I4SD2MMXU26MXSHDA1$phsB$cHzmagf	Current 4 Detector 2 phase B subharmonic Frequency
I4SD2MMXU26MXSHDA1$phsC$cHzmagf	Current 4 Detector 2 phase C subharmonic Frequency
I4SD2MMXU26MXSHDA1$phsA$cValmagf	Current 4 Detector 2 phase A subharmonic Magnitude
I4SD2MMXU26MXSHDA1$phsB$cValmagf	Current 4 Detector 2 phase B subharmonic Magnitude
I4SD2MMXU26MXSHDA1$phsC$cValmagf	Current 4 Detector 2 phase C subharmonic Magnitude
I4SD2MMXU26MXTotSHD$phsA$cValmagf	Current 4 Detector 2 phase A subharmonic distortions (%)
I4SD2MMXU26MXTotSHD$phsB$cValmagf	Current 4 Detector 2 phase B subharmonic distortions (%)
I4SD2MMXU26MXTotSHD$phsC$cValmagf	Current 4 Detector 2 phase C subharmonic distortions (%)

S1SD1MMXU27

This section defines data for the logical node S1SD1MMXU27.

Data Name	Name
S1SD1MMXU27MXSHDA1$phsA$type	Summation 1 Detector 1 phase A Type
S1SD1MMXU27MXSHDA1$phsB$type	Summation 1 Detector 1 phase B Type
S1SD1MMXU27MXSHDA1$phsC$type	Summation 1 Detector 1 phase C Type
S1SD1MMXU27MXA$phsA$cValmagf	Summation 1 Detector 1 phase A Magnitude
S1SD1MMXU27MXA$phsB$cValmagf	Summation 1 Detector 1 phase B Magnitude
S1SD1MMXU27MXA$phsC$cValmagf	Summation 1 Detector 1 phase C Magnitude
S1SD1MMXU27MXSHDA1$phsA$cHzmagf	Summation 1 Detector 1 phase A subharmonic Frequency
S1SD1MMXU27MXSHDA1$phsB$cHzmagf	Summation 1 Detector 1 phase B subharmonic Frequency
S1SD1MMXU27MXSHDA1$phsC$cHzmagf	Summation 1 Detector 1 phase C subharmonic Frequency
S1SD1MMXU27MXSHDA1$phsA$cValmagf	Summation 1 Detector 1 phase A subharmonic Magnitude
S1SD1MMXU27MXSHDA1$phsB$cValmagf	Summation 1 Detector 1 phase B subharmonic Magnitude
S1SD1MMXU27MXSHDA1$phsC$cValmagf	Summation 1 Detector 1 phase C subharmonic Magnitude
S1SD1MMXU27MXTotSHD$phsA$cValmagf	Summation 1 Detector 1 phase A subharmonic distortions (%)
S1SD1MMXU27MXTotSHD$phsB$cValmagf	Summation 1 Detector 1 phase B subharmonic distortions (%)
S1SD1MMXU27MXTotSHD$phsC$cValmagf	Summation 1 Detector 1 phase C subharmonic distortions (%)

S1SD2MMXU28

This section defines data for the logical node S1SD2MMXU28.

Data Name	Name
S1SD2MMXU28MXSHDA1$phsA$type	Summation 1 Detector 2 phase A Type
S1SD2MMXU28MXSHDA1$phsB$type	Summation 1 Detector 2 phase B Type
S1SD2MMXU28MXSHDA1$phsC$type	Summation 1 Detector 2 phase C Type
S1SD2MMXU28MXA$phsA$cValmagf	Summation 1 Detector 2 phase A Magnitude
S1SD2MMXU28MXA$phsB$cValmagf	Summation 1 Detector 2 phase B Magnitude
S1SD2MMXU28MXA$phsC$cValmagf	Summation 1 Detector 2 phase C Magnitude
S1SD2MMXU28MXSHDA1$phsA$cHzmagf	Summation 1 Detector 2 phase A subharmonic Frequency
S1SD2MMXU28MXSHDA1$phsB$cHzmagf	Summation 1 Detector 2 phase B subharmonic Frequency
S1SD2MMXU28MXSHDA1$phsC$cHzmagf	Summation 1 Detector 2 phase C subharmonic Frequency
S1SD2MMXU28MXSHDA1$phsA$cValmagf	Summation 1 Detector 2 phase A subharmonic Magnitude
S1SD2MMXU28MXSHDA1$phsB$cValmagf	Summation 1 Detector 2 phase B subharmonic Magnitude
S1SD2MMXU28MXSHDA1$phsC$cValmagf	Summation 1 Detector 2 phase C subharmonic Magnitude
S1SD2MMXU28MXTotSHD$phsA$cValmagf	Summation 1 Detector 2 phase A subharmonic distortions (%)
S1SD2MMXU28MXTotSHD$phsB$cValmagf	Summation 1 Detector 2 phase B subharmonic distortions (%)
S1SD2MMXU28MXTotSHD$phsC$cValmagf	Summation 1 Detector 2 phase C subharmonic distortions (%)

S2SD1MMXU29

This section defines data for the logical node S2SD1MMXU29.

Data Name	Name
S2SD1MMXU29MXSHDA1$phsA$type	Summation 2 Detector 1 phase A Type
S2SD1MMXU29MXSHDA1$phsB$type	Summation 2 Detector 1 phase B Type
S2SD1MMXU29MXSHDA1$phsC$type	Summation 2 Detector 1 phase C Type
S2SD1MMXU29MXA$phsA$cValmagf	Summation 2 Detector 1 phase A Magnitude
S2SD1MMXU29MXA$phsB$cValmagf	Summation 2 Detector 1 phase B Magnitude
S2SD1MMXU29MXA$phsC$cValmagf	Summation 2 Detector 1 phase C Magnitude
S2SD1MMXU29MXSHDA1$phsA$cHzmagf	Summation 2 Detector 1 phase A subharmonic Frequency
S2SD1MMXU29MXSHDA1$phsB$cHzmagf	Summation 2 Detector 1 phase B subharmonic Frequency
S2SD1MMXU29MXSHDA1$phsC$cHzmagf	Summation 2 Detector 1 phase C subharmonic Frequency
S2SD1MMXU29MXSHDA1$phsA$cValmagf	Summation 2 Detector 1 phase A subharmonic Magnitude
S2SD1MMXU29MXSHDA1$phsB$cValmagf	Summation 2 Detector 1 phase B subharmonic Magnitude
S2SD1MMXU29MXSHDA1$phsC$cValmagf	Summation 2 Detector 1 phase C subharmonic Magnitude
S2SD1MMXU29MXTotSHD$phsA$cValmagf	Summation 2 Detector 1 phase A subharmonic distortions (%)
S2SD1MMXU29MXTotSHD$phsB$cValmagf	Summation 2 Detector 1 phase B subharmonic distortions (%)
S2SD1MMXU29MXTotSHD$phsC$cValmagf	Summation 2 Detector 1 phase C subharmonic distortions (%)

S2SD2MMXU30

This section defines data for the logical node S2SD2MMXU30.

Data Name	Name
S2SD2MMXU30MXSHDA1$phsA$type	Summation 2 Detector 2 phase A Type
S2SD2MMXU30MXSHDA1$phsB$type	Summation 2 Detector 2 phase B Type
S2SD2MMXU30MXSHDA1$phsC$type	Summation 2 Detector 2 phase C Type
S2SD2MMXU30MXA$phsA$cValmagf	Summation 2 Detector 2 phase A Magnitude
S2SD2MMXU30MXA$phsB$cValmagf	Summation 2 Detector 2 phase B Magnitude
S2SD2MMXU30MXA$phsC$cValmagf	Summation 2 Detector 2 phase C Magnitude
S2SD2MMXU30MXSHDA1$phsA$cHzmagf	Summation 2 Detector 2 phase A subharmonic Frequency
S2SD2MMXU30MXSHDA1$phsB$cHzmagf	Summation 2 Detector 2 phase B subharmonic Frequency
S2SD2MMXU30MXSHDA1$phsC$cHzmagf	Summation 2 Detector 2 phase C subharmonic Frequency
S2SD2MMXU30MXSHDA1$phsA$cValmagf	Summation 2 Detector 2 phase A subharmonic Magnitude
S2SD2MMXU30MXSHDA1$phsB$cValmagf	Summation 2 Detector 2 phase B subharmonic Magnitude
S2SD2MMXU30MXSHDA1$phsC$cValmagf	Summation 2 Detector 2 phase C subharmonic Magnitude
S2SD2MMXU30MXTotSHD$phsA$cValmagf	Summation 2 Detector 2 phase A subharmonic distortions (%)
S2SD2MMXU30MXTotSHD$phsB$cValmagf	Summation 2 Detector 2 phase B subharmonic distortions (%)
S2SD2MMXU30MXTotSHD$phsC$cValmagf	Summation 2 Detector 2 phase C subharmonic distortions (%)

S3SD1MMXU31

This section defines data for the logical node S3SD1MMXU31.

Data Name	Name
S3SD1MMXU31MXSHDA1$phsA$type	Summation 3 Detector 1 phase A Type
S3SD1MMXU31MXSHDA1$phsB$type	Summation 3 Detector 1 phase B Type
S3SD1MMXU31MXSHDA1$phsC$type	Summation 3 Detector 1 phase C Type
S3SD1MMXU31MXA$phsA$cValmagf	Summation 3 Detector 1 phase A Magnitude
S3SD1MMXU31MXA$phsB$cValmagf	Summation 3 Detector 1 phase B Magnitude
S3SD1MMXU31MXA$phsC$cValmagf	Summation 3 Detector 1 phase C Magnitude
S3SD1MMXU31MXSHDA1$phsA$cHzmagf	Summation 3 Detector 1 phase A subharmonic Frequency
S3SD1MMXU31MXSHDA1$phsB$cHzmagf	Summation 3 Detector 1 phase B subharmonic Frequency
S3SD1MMXU31MXSHDA1$phsC$cHzmagf	Summation 3 Detector 1 phase C subharmonic Frequency
S3SD1MMXU31MXSHDA1$phsA$cValmagf	Summation 3 Detector 1 phase A subharmonic Magnitude
S3SD1MMXU31MXSHDA1$phsB$cValmagf	Summation 3 Detector 1 phase B subharmonic Magnitude
S3SD1MMXU31MXSHDA1$phsC$cValmagf	Summation 3 Detector 1 phase C subharmonic Magnitude
S3SD1MMXU31MXTotSHD$phsA$cValmagf	Summation 3 Detector 1 phase A subharmonic distortions (%)
S3SD1MMXU31MXTotSHD$phsB$cValmagf	Summation 3 Detector 1 phase B subharmonic distortions (%)
S3SD1MMXU31MXTotSHD$phsC$cValmagf	Summation 3 Detector 1 phase C subharmonic distortions (%)

S3SD2MMXU32

This section defines data for the logical node S3SD2MMXU32.

Data Name	Name
S3SD2MMXU32MXSHDA1$phsA$type	Summation 3 Detector 2 phase A Type
S3SD2MMXU32MXSHDA1$phsB$type	Summation 3 Detector 2 phase B Type
S3SD2MMXU32MXSHDA1$phsC$type	Summation 3 Detector 2 phase C Type
S3SD2MMXU32MXA$phsA$cValmagf	Summation 3 Detector 2 phase A Magnitude
S3SD2MMXU32MXA$phsB$cValmagf	Summation 3 Detector 2 phase B Magnitude
S3SD2MMXU32MXA$phsC$cValmagf	Summation 3 Detector 2 phase C Magnitude
S3SD2MMXU32MXSHDA1$phsA$cHzmagf	Summation 3 Detector 2 phase A subharmonic Frequency
S3SD2MMXU32MXSHDA1$phsB$cHzmagf	Summation 3 Detector 2 phase B subharmonic Frequency
S3SD2MMXU32MXSHDA1$phsC$cHzmagf	Summation 3 Detector 2 phase C subharmonic Frequency
S3SD2MMXU32MXSHDA1$phsA$cValmagf	Summation 3 Detector 2 phase A subharmonic Magnitude
S3SD2MMXU32MXSHDA1$phsB$cValmagf	Summation 3 Detector 2 phase B subharmonic Magnitude
S3SD2MMXU32MXSHDA1$phsC$cValmagf	Summation 3 Detector 2 phase C subharmonic Magnitude
S3SD2MMXU32MXTotSHD$phsA$cValmagf	Summation 3 Detector 2 phase A subharmonic distortions (%)
S3SD2MMXU32MXTotSHD$phsB$cValmagf	Summation 3 Detector 2 phase B subharmonic distortions (%)
S3SD2MMXU32MXTotSHD$phsC$cValmagf	Summation 3 Detector 2 phase C subharmonic distortions (%)

S4SD1MMXU33

This section defines data for the logical node S4SD1MMXU33.

Data Name	Name
S4SD1MMXU33MXSHDA1$phsA$type	Summation 4 Detector 1 phase A Type
S4SD1MMXU33MXSHDA1$phsB$type	Summation 4 Detector 1 phase B Type
S4SD1MMXU33MXSHDA1$phsC$type	Summation 4 Detector 1 phase C Type
S4SD1MMXU33MXA$phsA$cValmagf	Summation 4 Detector 1 phase A Magnitude
S4SD1MMXU33MXA$phsB$cValmagf	Summation 4 Detector 1 phase B Magnitude
S4SD1MMXU33MXA$phsC$cValmagf	Summation 4 Detector 1 phase C Magnitude
S4SD1MMXU33MXSHDA1$phsA$cHzmagf	Summation 4 Detector 1 phase A subharmonic Frequency
S4SD1MMXU33MXSHDA1$phsB$cHzmagf	Summation 4 Detector 1 phase B subharmonic Frequency
S4SD1MMXU33MXSHDA1$phsC$cHzmagf	Summation 4 Detector 1 phase C subharmonic Frequency
S4SD1MMXU33MXSHDA1$phsA$cValmagf	Summation 4 Detector 1 phase A subharmonic Magnitude
S4SD1MMXU33MXSHDA1$phsB$cValmagf	Summation 4 Detector 1 phase B subharmonic Magnitude
S4SD1MMXU33MXSHDA1$phsC$cValmagf	Summation 4 Detector 1 phase C subharmonic Magnitude
S4SD1MMXU33MXTotSHD$phsA$cValmagf	Summation 4 Detector 1 phase A subharmonic distortions (%)
S4SD1MMXU33MXTotSHD$phsB$cValmagf	Summation 4 Detector 1 phase B subharmonic distortions (%)
S4SD1MMXU33MXTotSHD$phsC$cValmagf	Summation 4 Detector 1 phase C subharmonic distortions (%)

S4SD2MMXU34

This section defines data for the logical node S4SD2MMXU34.

Data Name	Name
S4SD2MMXU34MXSHDA1$phsA$type	Summation 4 Detector 2 phase A Type
S4SD2MMXU34MXSHDA1$phsB$type	Summation 4 Detector 2 phase B Type
S4SD2MMXU34MXSHDA1$phsC$type	Summation 4 Detector 2 phase C Type
S4SD2MMXU34MXA$phsA$cValmagf	Summation 4 Detector 2 phase A Magnitude
S4SD2MMXU34MXA$phsB$cValmagf	Summation 4 Detector 2 phase B Magnitude
S4SD2MMXU34MXA$phsC$cValmagf	Summation 4 Detector 2 phase C Magnitude
S4SD2MMXU34MXSHDA1$phsA$cHzmagf	Summation 4 Detector 2 phase A subharmonic Frequency
S4SD2MMXU34MXSHDA1$phsB$cHzmagf	Summation 4 Detector 2 phase B subharmonic Frequency
S4SD2MMXU34MXSHDA1$phsC$cHzmagf	Summation 4 Detector 2 phase C subharmonic Frequency
S4SD2MMXU34MXSHDA1$phsA$cValmagf	Summation 4 Detector 2 phase A subharmonic Magnitude
S4SD2MMXU34MXSHDA1$phsB$cValmagf	Summation 4 Detector 2 phase B subharmonic Magnitude
S4SD2MMXU34MXSHDA1$phsC$cValmagf	Summation 4 Detector 2 phase C subharmonic Magnitude
S4SD2MMXU34MXTotSHD$phsA$cValmagf	Summation 4 Detector 2 phase A subharmonic distortions (%)
S4SD2MMXU34MXTotSHD$phsB$cValmagf	Summation 4 Detector 2 phase B subharmonic distortions (%)
S4SD2MMXU34MXTotSHD$phsC$cValmagf	Summation 4 Detector 2 phase C subharmonic distortions (%)

VirtualInputs Logical Device

SUBSCRGGIO1

This section defines data for the logical node SUBSCRGGIO1.

Data Name	Name
SUBSCRGGIO1STInd1$stVal	External GOOSE Virtual Input 1
SUBSCRGGIO1STInd2$stVal	External GOOSE Virtual Input 2
SUBSCRGGIO1STInd3$stVal	External GOOSE Virtual Input 3
SUBSCRGGIO1STInd4$stVal	External GOOSE Virtual Input 4
SUBSCRGGIO1STInd5$stVal	External GOOSE Virtual Input 5
SUBSCRGGIO1STInd6$stVal	External GOOSE Virtual Input 6
SUBSCRGGIO1STInd7$stVal	External GOOSE Virtual Input 7
SUBSCRGGIO1STInd8$stVal	External GOOSE Virtual Input 8
SUBSCRGGIO1STInd9$stVal	External GOOSE Virtual Input 9
SUBSCRGGIO1STInd10$stVal	External GOOSE Virtual Input 10
SUBSCRGGIO1STInd11$stVal	External GOOSE Virtual Input 11
SUBSCRGGIO1STInd12$stVal	External GOOSE Virtual Input 12
SUBSCRGGIO1STInd13$stVal	External GOOSE Virtual Input 13
SUBSCRGGIO1STInd14$stVal	External GOOSE Virtual Input 14
SUBSCRGGIO1STInd15$stVal	External GOOSE Virtual Input 15
SUBSCRGGIO1STInd16$stVal	External GOOSE Virtual Input 16
SUBSCRGGIO1STInd17$stVal	External GOOSE Virtual Input 17
SUBSCRGGIO1STInd18$stVal	External GOOSE Virtual Input 18
SUBSCRGGIO1STInd19$stVal	External GOOSE Virtual Input 19
SUBSCRGGIO1STInd20$stVal	External GOOSE Virtual Input 20
SUBSCRGGIO1STInd21$stVal	External GOOSE Virtual Input 21
SUBSCRGGIO1STInd22$stVal	External GOOSE Virtual Input 22
SUBSCRGGIO1STInd23$stVal	External GOOSE Virtual Input 23
SUBSCRGGIO1STInd24$stVal	External GOOSE Virtual Input 24
SUBSCRGGIO1STInd25$stVal	External GOOSE Virtual Input 25
SUBSCRGGIO1STInd26$stVal	External GOOSE Virtual Input 26
SUBSCRGGIO1STInd27$stVal	External GOOSE Virtual Input 27
SUBSCRGGIO1STInd28$stVal	External GOOSE Virtual Input 28

SUBSCRGGIO1STInd29$stVal	External GOOSE Virtual Input 29
SUBSCRGGIO1STInd30$stVal	External GOOSE Virtual Input 30

System Logical Device

VIGGIO1

This section defines data for the logical node VIGGIO1.

Data Name	Name
VIGGIO1STInd1$stVal	Virtual Input 1
VIGGIO1STInd2$stVal	Virtual Input 2
VIGGIO1STInd3$stVal	Virtual Input 3
VIGGIO1STInd4$stVal	Virtual Input 4
VIGGIO1STInd5$stVal	Virtual Input 5
VIGGIO1STInd6$stVal	Virtual Input 6
VIGGIO1STInd7$stVal	Virtual Input 7
VIGGIO1STInd8$stVal	Virtual Input 8
VIGGIO1STInd9$stVal	Virtual Input 9
VIGGIO1STInd10$stVal	Virtual Input 10
VIGGIO1STInd11$stVal	Virtual Input 11
VIGGIO1STInd12$stVal	Virtual Input 12
VIGGIO1STInd13$stVal	Virtual Input 13
VIGGIO1STInd14$stVal	Virtual Input 14
VIGGIO1STInd15$stVal	Virtual Input 15
VIGGIO1STInd16$stVal	Virtual Input 16
VIGGIO1STInd17$stVal	Virtual Input 17
VIGGIO1STInd18$stVal	Virtual Input 18
VIGGIO1STInd19$stVal	Virtual Input 19
VIGGIO1STInd20$stVal	Virtual Input 20
VIGGIO1STInd21$stVal	Virtual Input 21
VIGGIO1STInd22$stVal	Virtual Input 22
VIGGIO1STInd23$stVal	Virtual Input 23
VIGGIO1STInd24$stVal	Virtual Input 24

VIGGIO1STInd25$stVal	Virtual Input 25
VIGGIO1STInd26$stVal	Virtual Input 26
VIGGIO1STInd27$stVal	Virtual Input 27
VIGGIO1STInd28$stVal	Virtual Input 28
VIGGIO1STInd29$stVal	Virtual Input 29
VIGGIO1STInd30$stVal	Virtual Input 30

EIGGIO2

This section defines data for the logical node EIGGIO2.

Data Name	Name
EIGGIO2STInd1$stVal	External Input 1
EIGGIO2STInd2$stVal	External Input 2
EIGGIO2STInd3$stVal	External Input 3
EIGGIO2STInd4$stVal	External Input 4
EIGGIO2STInd5$stVal	External Input 5
EIGGIO2STInd6$stVal	External Input 6
EIGGIO2STInd7$stVal	External Input 7
EIGGIO2STInd8$stVal	External Input 8
EIGGIO2STInd9$stVal	External Input 9
EIGGIO2STInd10$stVal	External Input 10
EIGGIO2STInd11$stVal	External Input 11
EIGGIO2STInd12$stVal	External Input 12
EIGGIO2STInd13$stVal	External Input 13
EIGGIO2STInd14$stVal	External Input 14
EIGGIO2STInd15$stVal	External Input 15
EIGGIO2STInd16$stVal	External Input 16
EIGGIO2STInd17$stVal	External Input 17
EIGGIO2STInd18$stVal	External Input 18
EIGGIO2STInd19$stVal	External Input 19
EIGGIO2STInd20$stVal	External Input 20

OCGGIO3

This section defines data for the logical node OCGGIO3.

Data Name	Name
OCGGIO3STInd1$stVal	Output Contact 1
OCGGIO3STInd2$stVal	Output Contact 2
OCGGIO3STInd3$stVal	Output Contact 3
OCGGIO3STInd4$stVal	Output Contact 4
OCGGIO3STInd5$stVal	Output Contact 5
OCGGIO3STInd6$stVal	Output Contact 6
OCGGIO3STInd7$stVal	Output Contact 7
OCGGIO3STInd8$stVal	Output Contact 8
OCGGIO3STInd9$stVal	Output Contact 9
OCGGIO3STInd10$stVal	Output Contact 10
OCGGIO3STInd11$stVal	Output Contact 11
OCGGIO3STInd12$stVal	Output Contact 12
OCGGIO3STInd13$stVal	Output Contact 13
OCGGIO3STInd14$stVal	Output Contact 14
OCGGIO3STInd15$stVal	Output Contact 15
OCGGIO3STInd16$stVal	Output Contact 16
OCGGIO3STInd17$stVal	Output Contact 17
OCGGIO3STInd18$stVal	Output Contact 18
OCGGIO3STInd19$stVal	Output Contact 19
OCGGIO3STInd20$stVal	Output Contact 20
OCGGIO3STInd21$stVal	Output Contact 21

PLGGIO4

This section defines data for the logical node PLGGIO4.

Data Name	Name
PLGGIO4STInd1$stVal	ProLogic 1
PLGGIO4STInd2$stVal	ProLogic 2
PLGGIO4STInd3$stVal	ProLogic 3
PLGGIO4STInd4$stVal	ProLogic 4
PLGGIO4STInd5$stVal	ProLogic 5
PLGGIO4STInd6$stVal	ProLogic 6
PLGGIO4STInd7$stVal	ProLogic 7
PLGGIO4STInd8$stVal	ProLogic 8
PLGGIO4STInd9$stVal	ProLogic 9
PLGGIO4STInd10$stVal	ProLogic 10
PLGGIO4STInd11$stVal	ProLogic 11
PLGGIO4STInd12$stVal	ProLogic 12
PLGGIO4STInd13$stVal	ProLogic 13
PLGGIO4STInd14$stVal	ProLogic 14
PLGGIO4STInd15$stVal	ProLogic 15
PLGGIO4STInd16$stVal	ProLogic 16
PLGGIO4STInd17$stVal	ProLogic 17
PLGGIO4STInd18$stVal	ProLogic 18
PLGGIO4STInd19$stVal	ProLogic 19
PLGGIO4STInd20$stVal	ProLogic 20
PLGGIO4STInd21$stVal	ProLogic 21
PLGGIO4STInd22$stVal	ProLogic 22
PLGGIO4STInd23$stVal	ProLogic 23
PLGGIO4STInd24$stVal	ProLogic 24

SChAlmGGIO5

This section defines data for the logical node SChAlmGGIO5.

Data Name	Name
SChAlmGGIO5STInd$stVal	Self-Check Alarm

TSAlmGGIO6

This section defines data for the logical node TSAlmGGIO6.

Data Name	Name
TSAlmGGIO6STInd$stVal	Time Synchronization Alarm

ComAlmGGIO7

This section defines data for the logical node ComAlmGGIO7.

Data Name	Name
ComGGIO7STInd$stVal	Communication Alarm

LEDGGIO8

This section defines data for the logical node LEDGGIO8.

Data Name	Name
LEDGGIO8STInd1$stVal	LED 1 status
LEDGGIO8STInd2$stVal	LED 2 status
LEDGGIO8STInd3$stVal	LED 3 status
LEDGGIO8STInd4$stVal	LED 4 status
LEDGGIO8STInd5$stVal	LED 5 status
LEDGGIO8STInd6$stVal	LED 6 status
LEDGGIO8STInd7$stVal	LED 7 status
LEDGGIO8STInd8$stVal	LED 8 status
LEDGGIO8STInd9$stVal	LED 9 status
LEDGGIO8STInd10$stVal	LED 10 status
LEDGGIO8STInd11$stVal	LED 11 status
LEDGGIO8STInd12$stVal	LED 12 status
LEDGGIO8STInd13$stVal	LED 13 status

SGGGIO9

This section defines data for the logical node SGGGIO9.

Data Name	Name
SGGGIO9STIntIn$stVal	Active Setting group

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